THURSDAY, AUGUST 28, 1873

THE REPORT OF THE SCIENCE COMMISSION ON THE OLD UNIVERSITIES

II.

IN relation to the Colleges, the attention of the Commissioners has been principally directed to the following points:—1. The Scholarships. 2. The Fellowships. 3. The Organisation of the Instruction given in the Colleges in relation to the Instruction given in the Universities. 4. Contributions from the Colleges to a fund for University purposes.

After giving a list of the Scholarships filled up in Oxford from January to December 1872, it is remarked that "it is evident upon a comparison of the numbers contained in this list that the Scholarships offered for Natural Science are but a small fraction of the whole number. The state of the case appears to be that the Colleges do not offer Scholarships for Natural Science because they fear they would not get good candidates from the schools; and the schools do not teach Natural Science because they are afraid of injuring the prospects of their pupils by diminishing their chances of obtaining a Scholarship. It cannot be doubted that the effect upon the schools of this unequal distribution of rewards has been, and is, very discouraging to scientific study; and that it has exerted a most unfavourable influence upon the number of Natural Science students."

Without being prepared to concur in this estimate of the relative value of the two objects, we are nevertheless of opinion that it is of great importance, with the view of promoting the study of Natural Science in the first grade schools throughout the country, that there should be an immediate, and ultimately a large, increase in the number of Scholarships offered for this subject by the Colleges.

The part of the report which deals with the Fellowships is of great importance.

After quoting from the evidence of the Chancellor of the University of Oxford and others, evidence to the effect that the present application of the revenues to Fellowships is exceedingly unsatisfactory, the report proceeds:—

"Whilst giving every weight to the considerations urged by Prof. Jowett, and admitting to the fullest extent the great stimulus which the higher education has received at Oxford from the system of election to Fellowships by open competition, we are nevertheless satisfied by the evidence laid before us that an unduly large proportion of the revenues of the Colleges is expended in sinecure Fellowships; and we have reason to believe that this opinion is shared by a large and increasing number of the resident members of both Universities. . . .

"It is doubtless advantageous to the country at large, as has been urged by some of our witnesses, that young men of ability, who choose to enter into one of the great professions, should be supported, or nearly so, in the early years of their professional career, and thereby be enabled to apply themselves at once to the higher studies of their profession, instead of wasting their energies in drudgery of some kind, for the mere purpose of obtaining a temporary livelihood. But this end may be secured by means of Fellowships tenable only for a limited period. It has been urged that the feeling of security given by the system of unlimited tenure greatly enhances the value of a Fellowship. No doubt it is a very comfortable thing for a young man to feel that, come what may, he is secure of an income so long as he chooses to remain single. But we can see no adequate reason why he should be thus comforted at the expense of the College, when he has preferred the more attractive prospect of a professional career in the outer world to the work of the College. . . .

"We are therefore decidedly of opinion that the Fellowships awarded as prizes are excessive in number if not in value, and that the system ought to be remodelled. We are further of opinion that in any such remodelling a considerable proportion of the Fellowships should be suppressed or consolidated for the purposes of contributing to the general fund of the University and of endowing, within the Colleges and the University, new institutions, new offices, in aid of education or research. But it must be remembered that, as Prof. Jowett has stated, the property of the Colleges at Oxford, in some instances at least is greatly increasing, so that quite independently of the suppression of Fellowships there will in all probability be considerable sums available for these purposes. In any case, therefore, we are prepared to admit that a great part of the Fellowships ought to be retained as Fellowships, and the problem that has to be solved is how to employ those which are so retained in the most useful manner possible.

"The following are the chief purposes to which, in our judgment, the Fellowships should be applied:—

"In the first place, a certain but not a very large proportion of the Fellowships will be always required, as at present, for the payment of the persons entrusted with the management of the College estates, and with the government and administration of the Colleges themselves.

"Secondly, a large number of the Fellowships is at present employed, and probably a still larger number ought hereafter to be employed, in connection with the instruction given in the Colleges.

"Thirdly, a smaller, but still a considerable number of Fellowships ought to be employed as Terminable Prize Fellowships.

"Fourthly, a certain number of Fellowships ought, as we have already said, to be united with Professorships in the University; the University professor becoming *ex officio* a Fellow of the College and a member of its governing body.

"Lastly, it is, in our opinion, most important that a certain number of Fellowships should be appropriated to the direct promotion of learning and research in various directions. It has been objected to this proposal that the Fellowship system, as hitherto administered, has not shown any great tendency to encourage original research, either in the field of learning or in that of Science; that, when an office is created simply and solely with the view of giving a man leisure and opportunity for original research, there is always the appearance, to say the least, of creating a sinecure; and that it is impossible, as Prof. Jowett has said, to get a man for money who can make a discovery. But, though you cannot get a man for money

to make a discovery, you may enable a man who has shown a special capacity for research to exert his powers; and we are of opinion that, unless an effort is made to do this, one of the great purposes for which learned bodies, such as the Colleges, exist, may run the risk of being wholly lost sight of. Scientific discoveries rarely bring any direct profit to their authors, nor is it desirable that original investigation should be undertaken with a view to immediate pecuniary results. 'Research,' as Lord Salisbury has observed, is 'unremunerative; it is highly desirable for the community that it be pursued, and, therefore, the community must be content that funds should be set aside to be given, without any immediate and calculable return in work, to those by whom the research is to be pursued.'

"It may be that properly qualified candidates for such scientific offices would not at first be numerous, but we believe that eventually a considerable number of Fellowships might be advantageously devoted to the encouragement of original research.

"We think that such Fellowships as might be expressly destined for the advancement of Science and Learning should only be conferred on men who by their successful labours have already given proof of their earnest desire, and of their ability, to promote knowledge; and we believe that appointments, made with a due regard to this principle, would be abundantly justified by results. A man who has once acquired the habit of original scientific work, is very unlikely ever to lose it, excepting through a total failure of his health and strength; and even if it occasionally happened that a Fellowship awarded on the grounds of merit, as shown in original research, should only contribute to the comfort of the declining years of an eminent man of science, there are many persons who would feel that it could not have been better expended in any other way.

"We should not wish to attach any educational duties properly so called to a Fellowship awarded with a view of encouraging original research in Science. But for many reasons we should think it desirable that the holder of such a Fellowship should be expected to give an account, from time to time, in the form of public discourses, of the most recent researches in his own department of Science."

The last section of the Report dealing with the duty of the Universities and Colleges with regard to the advancement of Science is so important that we give it at length:—

"*Research a primary Duty of the Universities*

"On no point are the witnesses whom we have examined more united than they are in the expression of the feeling that it is a primary duty of the Universities to assist in the Advancement of Learning and Science, and not to be content with the position of merely educational bodies. We entirely concur with the impression thus conveyed to us by the evidence, and we are of opinion that the subject is one to which it is impossible to call attention too strongly. We think that if the Universities should fail to recognise the duty of promoting original research, they would be in danger of ceasing to be centres of intellectual activity, and a means of advancing Science would be lost sight of which, in this country, would not easily be supplied in any other way. There is no doubt that at the present time there is a very strong feeling in the country in favour of the wide diffusion of education, and of the improvement of all arrangements and appliances which tend to promote it, from the simplest forms of primary instruction up to the most advanced teaching that can be given in an University. But there is some reason to believe that the preservation and increase of knowledge are objects which are not as generally appreciated by the public, and of which the importance is not so widely felt as it should be. On this point we would direct especial attention to the remarks of Sir Benjamin Brodie: 'For education we construct an elaborate and costly machinery, and are willing, for this end, to make sacrifices: but, on the other hand, the far more difficult task of extending knowledge is left to the care of individuals, to be accomplished as it may; and yet it is this alone which renders education itself possible. I really am inclined to think that in former days a more real and earnest desire must have existed to preserve knowledge as a valuable national commodity for its own sake than exists now; and the reason that I say this is, that we have existing in the Universities of Oxford and Cambridge records of another condition of things with regard to knowledge than that which exists at present. In the first place we have extensive libraries which could only have been founded and preserved for the sake of the preservation of knowledge itself; and in the next place the collegiate foundations in the Universities were originally and fundamentally, although not absolutely and entirely, destined for the same objects. . . . This object is certainly not less important in modern than in ancient society. I presume that in the middle ages knowledge would altogether have perished if it had not been for such foundations, and it appears that now from other causes the pursuit of knowledge and of general scientific investigation is subject to very real dangers, though of another kind to those which then prevailed, and which make it very desirable for us to preserve any institutions through which scientific discovery and the investigation of truth may be promoted. . The dangers to which I refer are dangers which arise partly even from the growing perception of the practical importance of knowledge, which causes a very great draught indeed to be made upon the scientific intelligence of the country. In the first place, almost every scientific man is caught up instantly for educational purposes, for the object of teaching alone; and, in the next place, a very great draught indeed is made upon Science for economical purposes; I mean for purposes connected with practical life. In sanitary matters we have numerous examples of the vast amount of work done by scientific men for public and practical objects. So that the supply of scientific men is not equal to the demand for those objects alone. Manufactures offer another great field of scientific employment, and it is to be observed that these are the only ways through which an income can be obtained, the pursuit of scientific truth being an absolutely unremunerative occupation.'

"We believe that the dangers referred to in these remarks are real; and their existence induces us to lay down, as emphatically as possible, the position that the promotion of original work in Science should be regarded as one of the main functions of the Universities, and should be specially incumbent upon the holders of those fellowships which, as we have already recommended,

should be awarded with a view to encouraging original research. As regards the professors, we have already insisted on the importance of so arranging their duties as to give them abundant leisure, and, what is no less indispensable, abundant opportunities for original investigation, by providing the external appliances necessary for it. We think that the great national interests connected with the advancement of Science form one, although only one, of the grounds upon which the endowment of professorial offices is defensible, and regard it as a great advantage that an opportunity is afforded by the peculiar circumstances of the Universities of giving encouragement and maintenance to a class of persons who are competent to advance Science, and who are willing to make its advancement the principal business of their lives.

"We have already stated, but we would repeat it here, that we would on no account have offices founded within the Universities without special duties attached to them. It is an absolute advantage, if not in all, at least in many cases, to a man who is engaged in some abstract part of Science, to be compelled to produce, in the form of public discourses, the results of his labours; and it can be no disadvantage to him, under any circumstances, to be obliged to devote some moderate part of his time to showing, if it were only by the example of his own work, to younger men, how scientific studies should be carried on with the view of promoting human knowledge. We believe that in all ordinary cases a certain amount of educational work is of advantage to the scientific worker, and we also believe that for the promotion of the highest scientific education it is very desirable to bring the original worker into direct personal contact with the student.

"We have also already spoken of the propriety of awarding Fellowships in certain instances, not, as at present, by an examination test, but for services rendered to Science in Original Research. Although we should wish, as we have already said, to see this done from time to time (as it has already been done at Cambridge) in the case of persons who have already made themselves eminent in Science, and whose accepting the Fellowship is rather to confer an honour upon the office than to receive one from it, we also think that a wider application should be given to this principle; and, that whenever a Fellowship in Natural Science is offered for competition among the younger Graduates of the University, such evidence as any candidate can offer of his aptitude to become an useful worker in Science, should always be taken into account in the award. Nothing, we believe, would tend to give the students at the Universities so just an idea of what Science is, or of what the objects are which those who pursue it should have in view, as the adoption of the principle by the Universities and the Colleges, that the highest honours and rewards in Natural Science are to be conferred upon men who can offer some evidence that their names are likely afterwards to find a place on the list of those who have added to human knowledge.

"The proposals to which we attach the most importance with a view to the encouragement of Original Research at the Universities are the two to which we have just referred: (1) the establishment of a complete Scientific Professoriate; (2) the appropriation, under certain conditions, of Fellowships to the maintenance of persons engaged in Original Research. But, in addition to these main proposals, other suggestions are contained in the evidence before us, to which we would call especial attention: (1) that Laboratories should be founded expressly intended for Research, and for the Training of Advanced Students in the methods of research; (2) that Scientific Museums and Collections should be maintained to an extent beyond what is required for purely educational purposes; (3) that a Doctorate in Science should be instituted.

"*Proposed Laboratories for Research*

"It is one of the disadvantages of an University course that a young man, up to the time of taking his degree, is straining every nerve in order to master a certain amount of knowledge in which he has to pass an examination; and however improving this process may be to him in certain respects, the impression is widely entertained that it is not caculated to develope the originality of his mind, or those peculiar qualities which fit a man to become a discoverer in Science. As it is indispensably necessary that the student should be well grounded in his work, and should have a thorough comprehension of the methods and principles of his branch of Science, before he attempts to add to it, it is not easy to see how this disadvantage could be remedied during his undergraduate course; but as soon as his examinations are passed, it is surely time that he should be led to regard his studies from another point of view, and to give them a different direction. He should then be placed in a laboratory devoted to original research, and under the immediate care of persons who are principally engaged in work of that nature.

"On this point we would again refer to the evidence of Sir Benjamin Brodie: 'I should like (speaking of my own department and departments which are cognate with it, and I have no doubt that the same remark would also apply to Physiology and to other subjects) to see those professors have under their control laboratories suited for scientific research and investigation, in which they should take a certain limited number of students who would work, partly as their pupils and partly as their assistants, for those ends. And I should myself say that this is an educational function of the most important character possible, because you would here really carry scientific education to its end. If you do not do this you stop short of the most important part of all in scientific education. Now the real perfection of Science is shown only in scientific inquiry—the perfection of Science not only in its general results, but the perfection of Science as an instrument for education; and if you leave out in the University system any provision for scientific research, you are leaving out the most important feature of the subject. Those pupils would be persons who would ultimately pursue the science as their main business in life, and become in their turn the teachers and the professors of the subject. I am not giving a mere chimera or dream, but this is already, though not exactly in the way that I am suggesting, carried out to a great extent in Germany.'

"No less important, as giving one view of this question, is the evidence which we have received from Dr. Frankland, who says, 'In my opinion the cause of this slow

progress of original research (in England) depends, in the first place, upon the want of suitable buildings for conducting the necessary experiments connected with research; secondly upon the want of funds to defray the expenses of those inquiries, these expenses being sometimes very considerable; but, thirdly and chiefly, I believe that the cause lies in the entire non-recognition of original research by any of our Universities. Even the University of London, which has been foremost in advancing instruction in experimental Science, gives its highest degree in Science without requiring any proof that the candidate possesses the faculty of original research, or is competent to extend the boundaries of the science in which he graduates. I consider that this circumstance is the one which chiefly affects the progress of research in this country, because if we inquire into the origin of those numerous Memoirs upon original investigations that come from Germany, we find that a considerable proportion of them are investigations made by men who are going in for their Science degrees, and who are compelled, in the first instance, to make those investigations, and they attain by that means the faculty and liking for original research, and frequently follow it out afterwards; so that a considerable proportion of the papers themselves are contributed in the first place by those men going in for degrees, and a considerable proportion of the remainder are obtained, I believe, through the influence of this previous training in research upon the men who have taken the degrees. Further, the entire ignoring of research in the giving of degrees in this country diverts also, or has a tendency to divert, the attention of the professors and teachers in this country from original research. They have not to take it into their consideration in the training of their students; they have not to devise, as is the case in Germany, suitable subjects for research to be pursued by their students; and thus their attention is, as it were, taken away entirely from this highest field of Science. And, indeed, if they themselves devote some of their time to original research, it almost appears to them to be a neglect of their class duties-because their class duties do not require it. Their stu, dents are to be trained for subjects which are foreign to original research; they are to be trained chiefly in subjects that are to be taught by lectures, and by what I should call "descriptive," as distinguished from "experimental" or "practical" teaching; and, consequently, I think that in both ways—both by not bringing students into contact with original experimental work, and by diverting the attention of the teachers and professors in this country from such work, great damage is done to the progress of investigation in Great Britain by the attitude of our Universities.'

"Sir William Thomson has gone even further, and has expressed an opinion that the systems of examination in the Universities, as at present arranged, so far from doing anything to encourage the spirit of scientific research, have an exactly opposite tendency. 'That, to some degree, competitive examinations produce an elementary smattering of Science I have no doubt whatever, but I cannot see that they produce much beneficial influence; and in the higher parts especially, they have, I fear, a very fatally injurious tendency in obstructing the progress of Science.'

"The kind of assistance which we should desire to see given in the English Universities to young men who have completed their university course, and who propose to adopt a scientific career, has been from time to time afforded at various institutions in the United Kingdom, among which we may particularly mention the Laboratory of the University of Glasgow, under the direction of Sir W. Thomson. The plan has been adopted in some of the German Universities, and even in the great Polytechnic Schools of that country. In France it has recently been organised on a most complete and extensive scale. The École Pratique des Hautes Études is a Government Institution of which the object is to encourage young men to devote themselves to scientific research, and to give them opportunities of learning its methods. The course pursued by this institution is to take young men who have completed their preliminary scientific studies, and, allowing them an annual stipend to defray the expenses of their maintenance, to place them under the care of competent professors, who give them assistance and advice in their first researches, and to whom they afterwards become useful. This plan appears to us so excellent in itself, and at the same time so academic in its general character, that we desire to recommend it for adoption at Oxford and Cambridge. To insure due attention to both classes of students, it would be proper that the laboratories intended for training in the methods of research should be distinct from those in which more elementary instruction is given.

"We are also of opinion that arrangements should be made in some of the public buildings of the Universities, for giving opportunities to members of the Universities, no longer *in statu pupillari*, of prosecuting researches; although we should regard it of primary importance that these arrangements should be such as not to interfere with the teaching duties, or with the scientific work, of the professors. We agree with Dr. Frankland that one 'cause of the slow progress of original research' in England is 'the want of suitable buildings for conducting the necessary experiments connected with research;' and we think that the Universities might, with great propriety, supply this want, so far as their own members are concerned. We also think that collections of apparatus should be formed, which would be available for the use of such independent workers in Science. There are some obvious difficulties involved in this plan, which has been strongly recommended by some of our witnesses, but which, so far as we are aware, has not been anywhere practically tried. We should, however, look with confidence to such a body as the proposed 'University Council of Science' to frame suitable regulations as to the fitness of the persons admitted to the privilege of working in an University laboratory, and as to the securities to be taken for proper care in the use of valuable instruments. We are disposed to think that, under the special circumstances of the Universities, they would do more to promote original work by offering facilities of the kind which we have described than by making grants of money similar to those which are made in aid of special researches by the Government Grant Committee of the Royal Society. The plan would have the collateral advantage of rendering residence at the Universities attractive to scientific men.

"*Proposed Special Scientific Collections*

"Although we think it desirable that Scientific Museums and Collections should be maintained in the Universities to an extent which would render them available for original research, as well as for the purposes of education, we do not attach the same importance to this point as to the preceding, because museums and collections have been formed and will be formed in other places than in Universities, whereas laboratories adapted for the instruction of students in the methods of scientific investigation are not likely to be founded except in connection with educational institutions; and although it is a disadvantage to a scientific man not to have all the collections that he desires immediately at his hand, yet, considering the proximity of the Universities to London, it cannot be said that this disadvantage amounts to more than an inconvenience.

"We also are of opinion that it is very desirable that such more extensive collections as may be formed in the Universities should, as far as possible, be kept separate from the more limited collections intended for educational purposes. A Museum may be very easily made too large for these purposes, and instead of giving the student clearer ideas, may serve to confuse him.

"*Proposed Doctorate in Science*

"We have already referred to the possibility of instituting Higher Degrees, to be conferred upon students, not in accordance with the results of an examination, but upon their giving proof of capacity for original research. The evidence of Dr. Frankland and of Sir William Thomson, which we have already quoted, and to which we might add that of the late Prof. Rankine, appears to us conclusive upon the point that there is a real danger in the examination system; and in our opinion this danger might be guarded against by instituting a higher degree in Science, the obtaining of which should be regarded as a great honour, and which should not be awarded except with reference to original work. The plan of requiring from a candidate for the Doctorate in Science a dissertation embodying an account of some original research of his own is strongly approved by such competent witnesses as Dr. Siemens, Dr. Carpenter, and Prof. Frankland. This plan has been adopted in several of the German Universities, and has now become the established rule in France."

METEOROLOGICAL CONFERENCE AT LEIPSIG DURING AUGUST 1872*

OF the Congresses which have recently been held, none were more urgently called for than an International Congress of Meteorologists. Doubtless even under the diverse systems of observation which have been in use at national observatories and among meteorologists of different countries, large and valuable contributions have been made to Climatology and other departments of Meteorology. We need only refer to the various charts which have been published, showing the geographical distribution of atmospheric and oceanic temperature, of atmospheric pressure, of humidity, of prevailing winds, and of rainfall, and to the enormous amount of materials now being amassed, illustrative of the nature and course of storms, to show the important results which have been obtained. It must, however, be confessed that, as respects nearly the whole of this information, it can be regarded as valuable only in the sense of its being sufficiently approximate so as to meet the requirements of some of the more pressing practical questions of the science, and not because it is precise.

It is when we attempt inquiries into such questions as the diurnal and annual march of the different meteorological elements, and the relations of these elements *inter se*, and of weather on a large scale, that the general unsatisfactoriness of the systems by which observations are made in different countries comes to be forcibly felt, owing to their want of precision and uniformity. The want of uniformity is most conspicuous as respects temperature, humidity, and wind—or just those fundamental facts which must be scientifically observed and discussed before we can hope to solve the problem of weather changes.

In order to bring about a greater uniformity of procedure in different countries, it was proposed to hold a Meteorological Congress at Vienna in 1874. In June last, Bruhns of Leipsig, Wild of St. Petersburg, and Jelinek of Vienna, issued an invitation to meteorologists to attend a preliminary conference to be held at Leipsig in August, for the purpose of preparing the programme for the Vienna Congress, to instigate preparatory experiments on some of the more important questions, and thereby render it possible for the Congress to arrive at immediate conclusions on many points. The Conference was thus only consultative. Accompanying the invitation were a series of twenty-six questions, which it was proposed to submit to the consideration of the Conference.

Upwards of fifty persons attended the meetings of the Conference, which lasted three days. The opinions of the different speakers on the points raised by the 26 questions are detailed in the pamphlet before us, which contains also the written opinions of 14 meteorologists who were unable to be present, including the well-known names of Dove, Ribenson, Mohn, Mühry, and Wolf, as well as the results of the deliberations of the French meteorologists at Bordeaux in September. The subjects treated of may be conveniently classed under the heads of instruments, their position, the methods of discussing, publishing, and utilising the observations.

Barometers.—To those who have attempted to discuss weather, it is well known that nothing exact or satisfactory need be looked for in the result, unless observations from numerous barometers well distributed be available. It is thus desirable that barometers be procurable at a moderate price for stations of the second order. Are Board of Trade barometers—barometers fitted with a float—or aneroids, suited for such stations; or is there any other cheap form of barometer that would serve the purpose? After a lengthened discussion it was referred to Dr. Hann of Vienna to prepare a report for the Vienna Congress. The most diverse opinions were expressed regarding the aneroid, arising probably from the experience of the different writers and speakers—some aneroids going well for years with no permanent alterations occur-

* Report of the Proceedings of the Meteorological Conference at Leipsig. Protocols and Appendices. Translated from the Official Report, Appendix to Vol. vii. of the "Zeitschrift für Meteorologie." Published by the authority of the Meteorological Committee. London, 1873.

ring in their indications; some going well so long as a small range of pressure is recorded, but undergoing alterations after every great barometrical depression; some constantly altering in one direction, others in either direction, &c. Since, however, it can be safely affirmed of no aneroid, how good soever it may have proved itself to have been, that it will continue to indicate correctly for even a brief time to come, the Conference came to the sound conclusion that the aneroid should not be used instead of the mercurial barometer, but only as an interpolation instrument, to fill up blank when the mercurial barometer is out of order, or when it cannot be observed on board ships in rough weather.

Maximum and Minimum Thermometers.—Rutherford's minimum spirit thermometer was regarded as satisfactory. On it being pointed out by several members that this thermometer is liable to go out of order by the spirit evaporating and condensing in the upper end of the tube, Ebermeyer, of Aschaffenburg, stated that this objection could be removed if the tube were at its entrance into the bulb inserted nearly up to the inner side of the bulb. We commend this suggestion to opticians; for if Ebermeyer's experience be confirmed, a source of serious and not infrequent error will be removed. On the other hand the performance of no *maximum thermometer* was considered to be so satisfactory that a uniform construction could be generally recommended; and the opinion was expressed that it was very desirable that a trustworthy maximum thermometer was devised, not liable for instance to have the mercury disturbed during high winds like Negretti and Zambra's, or the index portion go out of order as Rutherford's or Phillip's.

Instruments for Radiation.—Mr. Symons, who has paid much attention to this question, has been requested to give a report to next Congress on the modes of observation adopted in England for radiation. But it must be confessed that the methods of observation in this important inquiry are still in a very primitive state. Mr. Salt well pointed out that at present the results obtained with different instruments were not comparable with each other, and one hardly knew with the instruments now in use what was really observed.

Hygrometers.—Since the dry and wet bulb hygrometer is not trustworthy at low temperatures and in cases of extreme dryness, and the hair hygrometer fails also at the dew points, and since there is no hygrometer yet devised, at least for regular observations at stations, which gives approximately exact results as to moisture in all cases, it was recommended to make further experiments and collect the experience of meteorologists on the subject. From the favourable opinions expressed by Wild and others of the action of the hair hygrometer, further experiments with this instrument are very desirable, so that it might be made available for more accurate observations on the hygrometry of the air at temperatures below the freezing-point than the dry-and-wet hygrometer admits of. Another desideratum is an extensive series of experiments with Regnault's hygrometer in conjunction with the dry-and-wet bulb hygrometer in dry hot climates such as N.W. India, for the purpose of ascertaining how far the readings of the dry-and-wet bulbs can be used as data from which the dew-point may become known; and determining the requisite data for the correction and completion of the present hygrometric tables, particularly at points below freezing, and at high temperatures combined with great dryness.

Wind.—Curiously enough, the question of proper instruments for measuring the velocity and force of the winds does not seem to have been under discussion, even though it is one of the most important and pressing questions of the science. Anemometers, both for velocity and pressure, are indispensable to properly equipped observatories. Now it cannot yet be said that the anemometers for velocity give quite correct indications that they are comparable, *inter se*, and that we have a practicable means of ascertaining their errors from time to time.

Equally remarkable was the omission in the discussions, to consider what are the required conditions which anemometrical stations ought to fulfil, so that the instrument shall indicate the true movement of the air over the region where it is placed; or, if this cannot be accomplished, what observations should be instituted in order to ascertain how far the direction of the wind is deflected by the physical configuration of the surface, and its force diminished (or in rare cases accelerated) as compared with the general movement of the air over the place.

Pressure anemometers at a moderate cost are a great desideratum. Little satisfactory is known of the relation of pressure to velocity.

Rain.—The Committee proposed that a report of all the experience regarding the position, size, height above ground, and time of reading the rain gauge which has been yet gained should be prepared for the Vienna Congress. For the preparation of such a report the great storehouse of facts at hand are those collected by Mr. Symons in the successive parts of his "British Rainfall" and "Meteorological Magazine," which the members of the Congress would do well to consult.

Evapometer.—The present state of the evapometer is one of the least satisfactory of all the meteorological instruments. Considering the importance of the drying property of the air in relation to meteorology generally, but especially as one of the most important constituents of climate, it is to be hoped that some method will be devised by which results, at least roughly comparable to begin with, may be obtained.

The difficult, but vital question of the position of the thermometer does not seem to have been faced by the conference. It is earnestly hoped that the Vienna Congress will not shirk this question, but will seriously discuss it and arrive at some decision, or suggest some steps to be taken, that will ultimately lead to the degree of uniformity which is so imperatively called for. Till this be secured, the expensive systems of horary or continuous registration of temperature carried on at the great observatories of this and other countries, cannot supply the data for the determination of temperature "constants," seeing that they are incomparable with each other, as well as with the observations made at those numerous stations of the secondary order to which we must look for the working out of the great national question of local climates in their bearing on the health, productions, and commerce of the country. The question would be of comparatively easy solution were it possible, in the interests of cosmical inquiries, to ignore the past. But it is essential in the

case of the older observatories to adhere to the same system of observing hitherto in use; until at least four or five years' observations have been made simultaneously with a second set of instruments placed in uniformity with those of other observatories.

The question of the practicability and utility of Weather and Storm Signals in Europe was considered, and it was remitted to Messrs. Buys Ballot, Scott, and Neumeyer, to collect the opinions of meteorologists on this important question, and draw up a report for the Vienna Congress. As it is understood that the committee have collected a good deal of information, some valuable results may be expected.

In the "Sequel to the Suggestions," Dr. Buys Ballot has suggested for the consideration of the Congress, the establishment, by societies, of stations in regions which are at present a blank. The Smithsonian Institution, the Dutch Meteorological Institute, and, in our country, the Scottish Meteorological Society have, with the means at their disposal, done a good deal in this direction, with results which have aided much in the furtherance of the science. But to fill up the enormous blanks which still disgrace British America, South America, most of Africa, and the Pacific, some concerted action on the part of meteorologists is indispensable. In connection with this proposed development, reference may be made to the scheme in contemplation by the Chinese Government, in carrying out which Mr. Campbell has been sent to this country to request advice from scientific authorities as to the general organisation of the stations, and to procure the necessary instruments, registers, &c. Towards the carrying out of this plan, the Congress will doubtless give Mr. Campbell very hearty support.

THE TYPHOID EPIDEMIC IN LONDON

THE recent outbreak of enteric fever in the West End of London presents many points of remarkable interest and teaches many useful lessons. Typhoid, Enteric, or Pythogenic fever, although a disease about which all our accurate knowledge is quite recent, is a fever about the causes of which we really know a great deal, but which, for all that, seems to appear from time to time in the places where it might be least expected.

About the nature of the poison which produces it we know as yet but little; we know that its habitat is in the refuse matters excreted from human intestines; we know that it is, under certain circumstances, developed in such excretal matters during their decomposition, but it is yet a moot point whether it is from time to time produced *de novo* under suitable conditions, or whether it is always necessary that some of the poison, however small a quantity, be introduced from without to cause such decomposing matters to become infectious. We are accustomed to regard this as the least specific of the diseases of its kind, but each outbreak which is traced to its source gives a rude shock to such ideas. The "filth-born" fever *par excellence*, it ought not, one would think, to need to wait to be introduced to the country places where, year after year for centuries, the shallow wells from which drinking water is obtained are, in effect, the drains of the premises; or to the town houses, in which the only ventilator to the sewer is the waste pipe which opens directly over the surface of the water in the cistern; but yet such is the case so universally, that when we cannot find out how the poison has been introduced, we should acknowledge our inability to do so, and not cut the knot by saying that it has originated on the spot, a conclusion for which, in the present state of our knowledge, we have no real proof whatever. The number of instances in which epidemics have been traced to single imported cases is now so great that, although it does not actually prove that such is always the case, still it should make us hesitate before declaring that the disease has broken out without direct importation in any given place.

The facts relating to the epidemic which still engages general attention in England, are, in order of sequence, and independently of any theory at all, as follows:—

The disease was noticed to be prevalent, in the middle and latter part of July, in certain houses in the parish of Marylebone, and notably in houses inhabited by medical men, houses where every possible precaution was believed to have been taken: it was observed by Dr. Murchison that an undue proportion of the persons attacked obtained their milk from a particular dairy, and on further investigation the conviction grew upon him that this milk was, somehow or other, contaminated with typhoid poison, and was spreading the disease. A difficulty arose, inasmuch as the locality in which the fever cases were was only a small part of the district supplied with milk from the suspected dairy; but Mr. Radcliffe, on examining the mode of distribution of the milk, showed that on the hypothesis that the milk from one of the several farms was contaminated before coming to the dairy, a localised outbreak or several localised outbreaks of fever must have been the result; so that any suspicion which may have existed as to the cause being possibly to be found in the precincts of the dairy in London, vanished at once.

On the other hand it was found that the owner of one of the dairy-farms had died on June 8; that he had been out of sorts since early in May, and sufficiently so for his two medical men to consult with a third on the subject; that the medical men all suspected that he had enteric fever; that this suspicion became stronger when the patient passed a large quantity of blood and putrid matter on June 1, which blood, &c., was ordered to be buried away from the house, as being most probably infectious; that the patient became considerably better towards the end of the first week of June, but that he died suddenly on June 8 while getting out of bed, no medical man being present; and finally that the medical attendant not being sure of the diagnosis of enteric fever, and considering that, anyhow, the man had got over it, certified that he died from heart disease, as he had for years been suffering from the effects of a "fatty heart;" nevertheless he took the precaution to have the body buried as speedily as possible, thinking that it might be infectious.

Taking all the facts together, these two series of events present at any rate a most remarkable coincidence; and when we find that enteric fever is and has for some months been prevalent in the villages near the farm and in daily communication with it, and that a son of the farmer has since had the disease, the conclusion is irresistible that the farmer died of enteric fever, and that he

had it at a time most singularly adapted to account for the outbreak in London.

The description of the farm-yard itself has been given elsewhere; suffice it to say that the well really drained the premises, and there is little doubt but that the poison got into the water, which was so bad that it had long been condemned as unfit to drink.

Hitherto epidemics of typhoid spread by means of milk have been attributed to the admixture of water as an adulteration with it; in this case no such suspicion arises, the milk was exceptionally rich, and was daily tested with sufficient accuracy to show adulteration with any but a small amount of water; but the water from the well was conveyed to the dairy pump by a pipe, and was used for washing the dairy utensils, so that it is easy to account for the presence of a small amount in some of the "churns," an amount, however, enough in so favourable a pabulum as milk to infect a very large quantity of it.

The lesson to be drawn is that all dairy-farms must be subject to regular sanitary supervision, especially as to their water supply, that such details of arrangement with regard to the cleansing of the vessels as may seem to offer least chance of the possibility of mischief should be adopted, and that the presence of infectious disease among the *employés* should be noted at once, and the proper precautions, which are now well known, taken.

W. H. CORFIELD

DOLMEN-MOUNDS v. FREE-STANDING AND TRIPOD CROMLECHS

MR. W. COPELAND BORLASE, the talented author of "Nænia Cornubiæ," in his communication to NATURE (vol. viii. p. 202), calls attention to the structure of Lanyon Quoit as an undeniable example of a British tripod cromlech or free-standing dolmen, by way of "protest against the *dictum* of Mr. Lukis being extended to our British examples, before a careful scrutiny has been made of every monument of the kind, from one corner of our isles to the other."

To my friend Mr. Borlase I owe my personal acquaintance with the numerous non-historic rude stone monuments in the Land's End district; and, as he is a life-long resident in the immediate vicinity of these interesting relics, to which I am a mere casual visitor, it is with feelings of great delicacy and diffidence that I now venture to place in a somewhat different aspect the statements and conclusions which he would wish your readers to adopt.

It were strange if Mr. Borlase did not turn out the best authority on early Cornish remains, for within six or seven miles of his residence at Castle Horneck (itself the site of an ancient Cornu-British encampment) there are at least twice as many dolmens as in all the rest of England; and though there may be perhaps as many in Anglesea, and twice as many in Wales, still West Cornwall has an advantage over both these districts, viz., that in Wales and Anglesea, the country of the Silures, there are no circles but only dolmens; in Cornwall, as in the Isle of Man, there are both circles and dolmens, the result, as Fergusson tells us, of an Ibero-Aquitanian admixture with Celtic and other (Scandinavian?) blood in the inhabitants. (*Vide* "Rude Stone Monuments," p. 163.)

Inheriting the tastes and following in the footsteps of his great-grandfather of antiquarian renown, Mr. Borlase has made great use of his opportunities, and is continually adding to, or accumulating store of facts with regard to the ancient history of our country. On the other hand, most antiquarians will probably agree with me in maintaining that the Lukis family may be reckoned some of the best, if not the very best authorities, on the chambered barrows of France and the Channel Islands. Enormous numbers of these structures have been scientifically examined and exhaustively described by the Messrs. Lukis: and the Rev. W. Lukis, in company with Sir Henry Dryden, is now employed in drawing to scale plans and elevations of the Isle of Man remains, and thereby carrying out his share of that scrutiny which Mr. Borlase anxiously demands in his letter.

When such authorities disagree, it would seem almost impertinent to interfere; but knowing my friend Mr. W. Lukis to be busily engaged in the Isle of Man, and too far off to personally examine the monument in dispute, whilst I was within a three hours' journey of the structure I determined to see the cromlech myself, and having done so, cannot allow Mr. Borlase's letter to remain unchallenged.

In taking up the cudgels for Mr. Fergusson, Mr. Borlase must not be looked upon as an implicit follower of that author, whose work he characterises as "*unreliable*,"* although, with him he is convinced "that the barrows and the cromlechs (if not the circles too) were the sepulchres of the dwellers in the hut circles and the earthworks; and that these latter were the residences of the Romanised Britons in the earlier centuries of the Christian era;" for before the appearance of "Rude Stone Monuments," he struck out for himself the formation of "a small class or species of dolmen," viz. the tripod cromlech, or dolmen proper (see "Nænia Cornubiæ," p. 14, *et seq.*), "where, as Col. Forbes Leslie remarks, 'the vertical supporters of the tabular stone are columnar,' and cannot be said to enclose a space."

Before proceeding, it may be as well to remark what Mr. Borlase ignores, viz. that (as may be seen from the title to his paper) the criticism of Mr. Lukis (deserved, if severe) of "Rude Stone Monuments," was based upon the application of the "*Free-standing*" theory, by the author, to the monuments of France, where he *proved* it was inapplicable. He said nothing at Somerset House about English monuments, although I believe it is his intention to say something about them on a future occasion. Mr. Borlase severely attacks Mr. Lukis, as though, in removing the *French* monuments from the supposed "free-standing class, he condemned all persons who held their own views on *British* ones. Mr. Lukis' views are not "hypotheses." He simply declares that the plans of *French* monuments which he produced before the Society of Antiquaries in London teach the proposition he laid down, and that it is the duty of those who are unacquainted with these examples to verify or disprove his statements and descriptions by visiting and inspecting them, and not to try and write him down when they have a very imperfect knowledge of them, or none at all. Previous to taking stock of Mr. Borlase's weighty evidence in support of Lanyon Quoit as originally a dolmen proper, *i.e.* a tripod cromlech, it should be noted what Fergusson states in respect to the West of England dolmens. In "Rude Stone Monuments," p. 163, he says: "*Even a cursory examination of these West Coast dolmens would, I think, be sufficient to prove to any one that the theory that all were originally covered with earthen mounds is utterly untenable.*" Exactly so! A *cursory* examination (which, if we are to believe Mr. Borlase, it appears that Fergusson never took the trouble to make, at least as regards the Cornish circles)† is very likely to lead the uninitiated hasty observer to suppose as above. What a prolonged investigation will prove I leave the reader to find further on. It is, at all events, unfortunate for this theory that Mr. Borlase can only produce *two*‡

* See Mr. Borlase's letter to the *Antiquary*, July 27, 1872.

† Letter to the *Antiquary*, July 27, 1872.

‡ Mr. Borlase mentions a possible third example, in his "Nænia," p. 26. A fallen cromlech, which may have possibly belonged to the "tripod class," is to be found near Helmen Tor, in the parish of Lanlivery.

examples of the tripod class in all Cornwall, viz. those of Lanyon and Caerwynen, and those are both *modern restorations of dilapidated ruins:* not a single stone of either of these examples is as it originally stood "*in situ.*" I did not see Mr. Borlase's letter to NATURE until the 3rd inst. On the 5th I obtained old Dr. Borlase's quaint volume on the "Antiquities Historical and Monumental of the County of Cornwall" (2nd ed. 1769), from a chapter in which volume Mr. Fergusson borrows his title of "Rude Stone Monuments," and on the following day visited Lanyon Quoit itself, sketched it, and compared the accounts of it on the very spot, and the following is the result of my investigation. I will take Mr. Borlase's statements categorically:—

(1) Lanyon Quoit "always *was*, as it is now, a free-standing dolmen."

(1) I humbly submit that Lanyon Quoit could not possibly have been always as it is now, from the fact of its having fallen, during a violent storm in 1815, whilst a comparison of its plan, as it now is in its restored state, and as it is given by Dr. Borlase, shows that the stones have been moved. The supporters were originally parallel, and are now at different angles to one another.

(2) "A tripod dolmen consisting of three slim pillars supporting on their summits a horizontal stone."

(2) I leave it to my readers to judge from the accompanying representation (from a photograph) of the cromlech whether, from the flat nature of the component stones, the supporters have not more or less the character of slabs rather than that columnar shape necessary for the so-called "Table stone proper:" and whether the *three slim pillars* would not have been more accurately described as *stout stone slabs*. The good Rector of Ludgvan, more than a hundred years ago, more aptly described these Cornish monuments.* "Three or four large flags or thin stones capped with a much larger one, which go by the British name of cromlêhs;" and again, "In several parts of Cornwall we find a large flat stone in a horizontal position (or near it) supported by other flat stones fixed on their edges and fastened in the ground." He never mentions pillars or columnar supports.

Mr. Borlase omits to mention the *fourth* slab (D) which is prostrate to the north (see plate), and the *fifth* and *sixth* flat stones (E and F) (possibly one broken in two) which lie imbedded in the soil at the foot of the south supporter, in which position they were apparently placed by the restorers in 1824 to prop up the upright slab. †

(3) Two drawings of it in its pristine condition by Canon Rogers, 1797, and Dr. Borlase, 1747, "agree in representing the slimness of the pillars, their distance apart, and great height of monument, features which render it not unlike a gigantic three-legged milking-stool."

Dr. Borlase's drawing shows *four* upright slabs, although the fourth does not apparently touch the capstone. I think that the supporters A, B, C, may be identified with those in Dr. Borlase's drawing with tolerable certainty, and D, now prostrate, was the fourth upright: that E and F were once also upright is highly probable.

(4) Then, as now, there was no mound about it. It stood on a low bank of earth and the area had been often disturbed by treasure-seekers."

(4) Dr. Borlase says "this cromlêh stands on a low bank of earth not two feet higher than the adjacent soil, about 20 feet wide and 70 feet long." The cromlech stands as much in as on the long mound which, according to the above measurements, would contain at least 2,000 cubic feet of earth, besides the *many rough stones* "not the natural furniture of the place," which Dr. Borlase also mentions. It bears every appearance of having formed the base of a long barrow.

* Antiquities, pp. 159 and 223.

† The younger Borlase acknowledges that "several of the stones had been broken." "Nænia," p. 18.

(5) "No houses are near it which could have received the stones of a denuded mound."

(5) A good road with rough stone walls on each side of it, which runs within a few yards of the cromlech, would well account for a portion of a denuded mound or cairn whose stones would be well adapted for building the walls and metalling the road.

(6) "It is difficult to see how a kist-vaen or septum of any kind could have been formed beneath the cap-stone. Had a wall of *small* stones been built from pillar to pillar the height of the superincumbent mound must have forced them inwards, a catastrophe which the "dolmen-builders" were always careful to avoid."

(6) Mr. Borlase must have had experience in his researches among the underground bee-hive caves to know how extensively microlithic dry masonry can be so built up as to resist any outside pressure of a superincumbent mound.

(7) "Had *large* stones placed on edge formed the walls of the kist, how is it they are *all* removed, while every other cromlech in the district retains them?"

(7) In "Nænia Cornubiæ," p. 43, Mr. Borlase writes, with regard to Lower Lanyon Cromlech, "Two stones are all that now remain, viz. the covering stone and one of the supporters; the others having been split up and carried away for building."

(8) "My strongest proof is yet to come. The interment was *not in the kist at all.* A grave had received the body six feet under the natural surface of the surrounding soil, and within the area described by the structure. This being the case, of what use could an enclosed kist have been, or why should the cenotaph be covered in at all?"

(8) Dr. Borlase discovered a pit within the area of the kist-vaen of Mulfra Quoit; and Mr. Borlase himself relates in his Nænia "a small pit seems to have been sunk in the centre" of Chywoone cromlech which he acknowledges was buried in a tumulus. This method of interment would therefore seem common to these three structures.

(9) "On the southern side of the structure, and so near it that a mound over the monument must have inevitably covered it up, stands a little circular ring cairn of the ordinary type, in the centre of which I found the remains of an inner ring which, though now rifled, had doubtless contained an interment."

(9) Dr. Borlase mentions with regard to the long low bank above-mentioned "at the south end, has (*sic*) many rough stones, some pitched on end, in no order; yet not the natural furniture of the surface, but designedly put there; though by the remains, it is difficult to say what their original position was."

Should Mr. Borlase's recognition of the confused aggregation of stones as a ring cairn be correct, it is by no means inconsistent with the theory that a mound once enveloped the cromlech and (as Mr. Borlase suggests would be the case) included the ring cairn in its area.

A parallel case occurs at Moustoir Carnac in Brittany, a plan and section of which, after M. Galles, is given in Fergusson's work, p. 358, and which I have personally examined. Here we find a true dolmen, *two* ring cairns, and a kist within one large long tumulus or barrow.

From my own inspection, I agree with the older Borlase, that "nothing is to be absolutely concluded, there having happened so many disturbances," but I have little doubts that whatever it was it formed some part of a structure in connection with and belonging to the cromlech.

Whilst comparing Cornish cromlechs with French dolmens, a comparison should be made between Chywoone cromlech* and Mr. Fergusson's characteristic example at Grandmont† in Bas-Languedoc (woodcut No. 128), with regard to which he says, "The umbrella form is hardly

* Nænia Cornubiæ, p. 55.

† "Rude Stone Monuments," pp. 343, 344. Figured in NATURE, vol. v. p. 387.

such as would ever be used for a chamber in a tumulus, but as a pent-roof is singularly suitable for an open-air monument."

The Chywoone cromlech has a peculiar convex-shaped cap-stone or pent-roof; so much so, that "the Quoit itself, seen from a distance, looks much like a mushroom." Mr. Borlase calls it the most perfect and compact cromlech in Cornwall. On exploration, "it was first of all discovered that the building rested on the solid ground, and not on the surrounding tumulus in which it had been subsequently buried." . . . "The barrow or cairn, which in some places nearly reaches the top of the side stones on the exterior, is thirty-two feet in diameter, and was hedged round by a ring of upright stones." . . . "It was discovered that the interstices between the side stones had been carefully protected by smaller ones placed

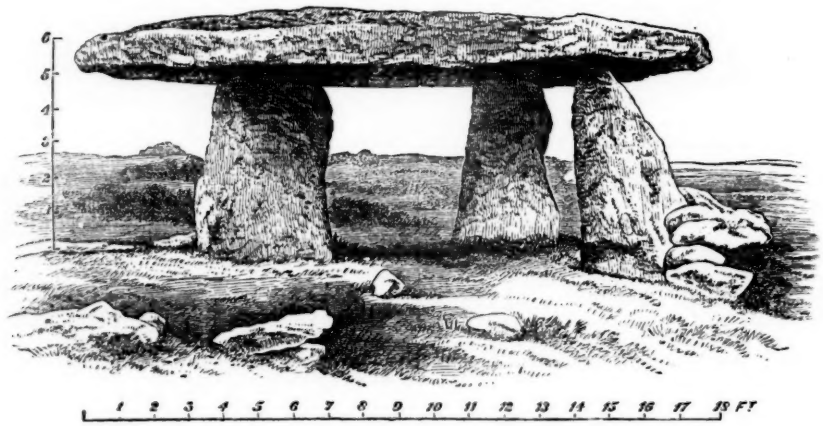

FIG. 1.—Restoration of sole remaining chamber of Lanyon Cromlech, showing fallen side slabs. View from the east.

in such a manner as to make it impossible for any of the rubbish of the mound to find its way into the kist."

Mr. Borlase remarks that "the *noscitur a socio* is a principle too lightly regarded by those on whom it forces a conclusion they do not like. In the case of antiquities it is, if judiciously used, extremely valuable." Applying this principle to the two Lanyon cromlechs, is it not just possible that some former owner of the upper cromlech has done what the late owner of the lower one did, viz.,* "remarking that the earth was rich, he thought it might be useful for a compost. Accordingly he sent his servants soon after to carry it off, when, having removed near a hundred cartloads, they observed the supporters of a cromlêh."

After the above it is hardly necessary to allude to the Caerwynen cromlech, which has been re-erected in a

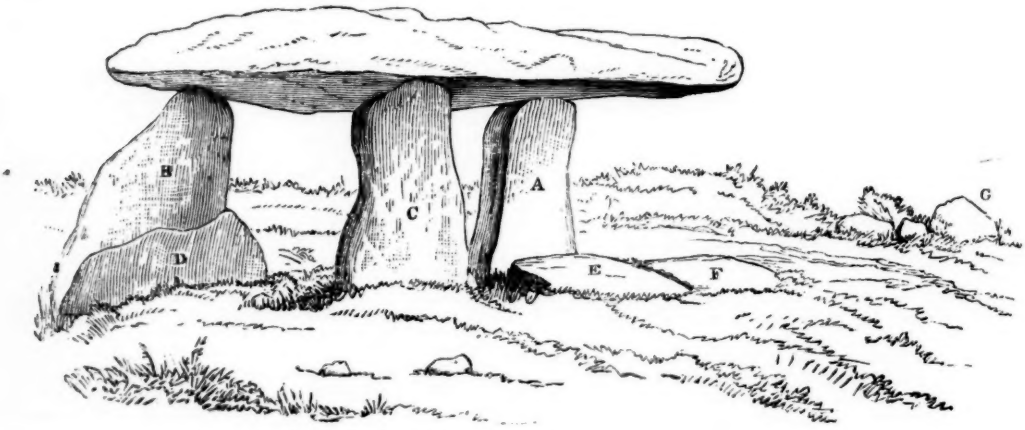

FIG. 2.—Sketch of Lanyon Quoit. from the north-west.

gentleman's park, more as an ornamental monument than as an archæological record. It is noticeable that in its immediate vicinity is a heap of stones overgrown with thicket, which evidently had some connection with the structure, which was composed of more than four stones.

In conclusion, it seems to me that the distinction between the dolmens proper and the kist-vaen cromlechs only adds to the difficulties surrounding the subject, and I fear that Mr. Borlase's letter will not tend to strengthen an already weak cause.

Pendennis Castle S. P. OLIVER

* "Nænia Cornubiæ," p. 43.

NOTES FROM THE "CHALLENGER"

VI.

WE left Bermudas on Thursday, June 12, for the Azores. His Excellency Gen. Lefroy, C.B., F.R.S., Governor of the Island, with his private secretary, Capt. Trench and Capt. Aplin, R.N., Captain Superintendent of the Dockyard, and a party of ladies, came on board in the afternoon, and we bade farewell, with great regret, to the friends from whom we had received such unvaried kindness during our stay. At half-past five we steamed out of the Camber and passed among the reefs to Murray's Anchorage, on the north-east side of the island, where we anchored for the night. Next morning we proceeded through the narrows, and early in the forenoon, having seen the last of the treacherous and beautiful purple shadows in the bright green waters of Bermudas, we set all plain sail and stood on our course to Fayal. In the afternoon we got up steam and sounded, lat. 32° 37′ N., long. 64° 21′ W., in 1,500 fathoms, with the usual grey-white chalky bottom which surrounds the reefs.

Our position, at noon of the 15th, was lat. 33° 41′ N., long. 61° 28′ W., 1,610 miles from Fayal.

On the morning of the 16th we sounded in 2,575 fathoms, the bottom a reddish ooze, containing a large number of foraminifera. The bottom temperature was 1°·5 C. A small, rather heavy trawl, with a beam 11½ feet long, was put over in the morning, but when it was hauled in, about five in the afternoon, it was found that it had not reached the bottom. This was the first case of failure with the trawl. It was probably caused by the drift of the ship being somewhat greater than was supposed. The net contained a specimen of one of the singular and beautiful fishes belonging to the Sternoptychidæ, an aberrant family of the Physostomi, distinguished by having on some part of the body ranges of spots or glands producing a phosphorescent secretion. The surface of the body is, in most of the species, devoid of scales, but, in lieu of them, the surface of the skin is broken up into hexagonal or rectangular areæ, or separated from one another by dark lines, and covered with a brilliant silvery pigment, dashed with various shades of green or steel blue. We have taken, in all, four or five species of these fishes, all in the net, when dredging or trawling, at great depths. I do not think they come from the bottom, however. It seems more probable that they are caught in the net on its passage to the surface, possibly at a depth of two or three hundred fathoms, where there is reason to believe there is a considerable development of a peculiar pelagic fauna.

On Tuesday, the 17th, the trawl was lowered at seven in the morning, and in the forenoon a sounding was taken in 2,850 fathoms.

Several examples of a large and handsome species of the genus *Scalpellum* came up in the trawl, a few still adhering to some singular-looking concretionary masses which they brought up along with them. One of these lumps, to which a large example of the barnacle was attached, was irregular in form, about three centimetres in length, and two in width. The surface was mammellated and finely granulated, and of a dark-brown colour, almost black. A fracture showed a semi-crystalline structure, the same dark-brown material arranged in an obscurely radiating manner from the centre, and mixed with a small quantity of a fragment of greyish-white clayey matter. This nodule was examined by Mr. Buchanan, and found to consist, like the nodules dredged in 2,435 fathoms at Station 16, 700 miles to the east of Sombrero, almost entirely of peroxide of manganese. Some other concretionary lumps were of a grey colour, but all of them contained a certain proportion of pyrolusite, and they seemed to be gradually changing into nodules of pyrolusite by some process of alteration or substitution. This is undoubtedly very singular, and it is difficult to conceive what can be the source of so widespread a formation of manganese. It is, of course, a matter of great difficulty to make anything like accurate analyses on ship-board. Mr. Buchanan is giving his careful attention to the whole subject of the chemical composition of the sea-bed, and I hope that the determination of the composition of a number of samples, when a favourable opportunity occurs, will throw additional light upon this and a number of other obscure points connected with the chemistry of modern geological formations.

Scalpellum regium, n. sp. (Fig. 1), is by far the largest of the known living species of the genus. The extreme length of a full-sized specimen of the female is 60 mm., of which 40 mm. are occupied by the capitulum, and 20 mm. by the peduncle. The capitulum is much compressed, 25 mm. in width from the occludent margin of the scutum to the back of the carina. The valves are 14 in number; they are thick and strong, with the lines of growth strongly marked, and they fit very closely to one another,

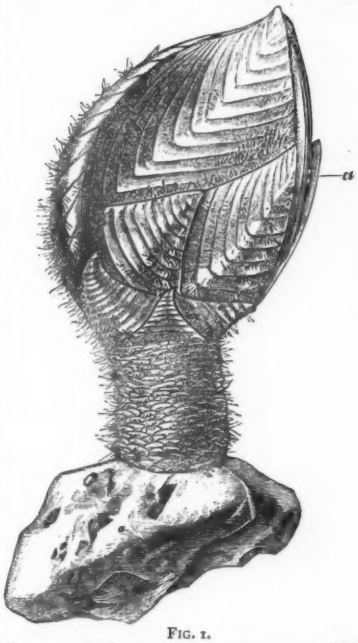

FIG. 1.

FIG. 2.

FIG. 1.—Scalpellum regium, Wy. Thomson. *a*, Males lodged within the edge of the scutum. FIG. 2.—Male of Scalpellum regium.

in most cases slightly overlapping. When living, the capitulum is covered with a pale-brown epidermis, with scattered hairs of the same colour.

The scuta are slightly convex, nearly once and a half as long as broad. The upper angle is considerably prolonged upwards, and, as in most fossil species, the centre of calcification is at the apex. A defined line runs downwards and backwards from the apex to the angle between the lateral and nasal margins. The occludent margin is almost straight. There is no depression for the adductor muscle, and there is no trace of notches or grooves along the occludent margin for the reception of the males; the interior of this valve is quite smooth. The terga are large, almost elliptical in shape, the centre of calcification at the upper angle. The carina is a handsome plate, very uniformly arched, with the umbo placed at the apex. Two lateral ridges, and a slight median ridge run from the umbo to the basal margin. The lower part of the valve widens out rapidly, and the whole is deeply concave. The rostrum, as in *Scalpellum vulgare*, is very minute, entirely

hidden during life by the investing membrane. The upper latera are triangular, the upper angle curving rather gracefully forwards; the umbo of growth is apical.

The rostral latera are long transverse plates lying beneath the basal margins of the scuta. The carinal latera are large and triangular, with the apex curved forwards very much like the upper latera, and the inframedian latera are very small, but in form and direction of growth nearly the same.

The peduncle is round in section and strong, and covered with a felting of light-brown hair. The scales of the peduncle are imbricated and remarkably large, somewhat as in *S. ornatum* Darwin. About three, or at most four scales, pass entirely round the peduncle. The base of attachment is very small, the lower part of the peduncle contracting rapidly. Some of the specimens taken were attached to the lumps of clay and manganese concretions, but rather feebly, and several of them were free, and showed no appearance of having been attached. There is no doubt, however, that they had all been more or less securely fixed, and had been pulled from their places of attachment by the trawl. On one lump of clay there were one mature specimen and two or three young ones, some of these only lately attached. The detailed anatomy of this species will be given hereafter, but the structure of the soft parts is much the same as in *Scalpellum vulgare*.

In two specimens dissected there was no trace of a testis or of an intromittent organ, while the ovaries were well developed; I conclude, therefore, that the large attached examples are females, corresponding, in this respect, with the species otherwise also most nearly allied, *S. ornatum*.

In almost all the specimens which were procured by us, several males, in number varying from five to nine, were attached within the occludent margins of the scuta, not imbedded in the chitinous border of the valve, or even in any way in contact with the shell, but in a fold of the body-sac quite free from the valve. They were ranged in rows, sometimes stretching—as in one case where there were seven males on one side—along the whole of the middle two-thirds of the edge of the tergum.

The male of *Scalpellum regium* (Fig. 2) is the simplest in structure of these parasitic males which has yet been observed. It is oval and sac-like, about 2 mm. in length by ·9 mm. in extreme width. There is an opening at the upper extremity which usually appears narrow, like a slit, and this is surrounded by a dark, well-defined, slightly raised ring. The antennæ are placed near the posterior extremity of the sac, and resemble closely in form those of *S. vulgare*. The whole of this sac, with the exception of a small bald patch near the point of attachment, is covered with fine chitinous hairs arranged in transverse rings. There is not the slightest rudiment of a valve, and I could detect no trace of a jointed thorax, although several specimens were rendered very transparent by boiling in caustic potash. There seems to be no œsophagus nor stomach, and the whole of the posterior two-thirds of the body in the mature specimens was filled with a lobulated mass of sperm-cells. Under the border of the mantle of one female there were the dead and withered remains of five males, and in most cases one or two of the males were not fully developed; several appeared to be mature, and one or two were dead, empty, dark-coloured chitine sacs.

On Wednesday, June 18, we resumed our course with a fine breeze, force 5 to 7, from the south-east. In this part of our voyage we were greatly struck with the absence of the higher forms of animal life. Not a sea-bird was to be seen, with the exception of a little flock of Mother Carey's chickens, here apparently always *Thalassidroma wilsoni*, which kept playing round the ship, on the watch for food, every now and then concentrating upon some peculiarly rich store of offal as it passed astern, and staying by it while the ship went on for a quarter of a mile, fluttering above the water and daintily touching it with their feet as they stooped and picked up the floating crumbs, and then rising and scattering in the air to overtake us and resume their watch.

The sea itself in the bright weather, usually under a light breeze, was singularly beautiful—of a splendid indigo-blue of varying shades as it passed from sunlight into shadow, flecked with curling white crests; but it was very solitary: day after day went by without a single creature (shark, porpoise, dolphin, or turtle) being visible. Some gulf-weed passed from time to time, and bunches of a species of *Fucus*, either *F. nodosus* or a very nearly allied form, evidently living and growing, and participating in the wandering and pelagic habits of *Sargassum*. The floating islands of the gulf-weed, with which we have become familiar as we have now nearly made the circuit of the "Sargasso Sea," are usually from a couple of feet to two or three yards in diameter, sometimes much larger; we have seen, on one or two occasions, fields several acres in extent, and such expanses are probably more frequent nearer the centre of its area of distribution.

They consist of a single layer of feathery bunches of the weed *Sargassum bacciferum*, not matted together, but floating nearly free of one another, only sufficiently entangled for the mass to keep together. Each tuft has a central brown thread-like branching stem studded with round air-vesicles on short stalks, most of those near the centre dead, and coated with a beautiful netted white polyzoon. After a time vesicles so encrusted break off, and where there is much gulf-weed the sea is studded with these little separate white balls. A short way from the centre, towards the ends of the branches, the serrated willow-like leaves of the plant begin, at first brown and rigid, but becoming, farther on in the branch, paler, more delicate, and more active in their vitality. The young fresh leaves and air-vesicles are usually ornamented with the stalked vases of a *Campanularia*. The general colour of the mass of weed is thus olive in all its shades, but the golden olive of the young and growing branches greatly predominates. This colour is, however, greatly broken up by the delicate branching of the weed, blotched with the vivid white of the encrusting polyzoon, and riddled by reflections from the bright blue water gleaming through the spaces in the network. The general effect of a number of such fields and patches of weed, in abrupt and yet most harmonious contrast with the leaves of intense indigo which separate them, is very pleasing.

These floating islands have inhabitants peculiar to them, and I know of no more perfect example of protective resemblance than is shown in the gulf-weed fauna. Animals drifting about on the surface of the sea with such scanty cover as the single broken layer of the seaweed, must be exposed to exceptional danger from the sharp sea-birds hovering above them, and from the hungry fishes searching for prey beneath, but one and all of these creatures imitate in such an extraordinary way, both in form and colouring, their floating habitat, and consequently one another, that we can well imagine their deceiving both the birds and the fishes. Among the most curious of the gulf-weed animals is the grotesque little fish, probably *Antennarius marmoratus*, which finds its nearest English ally in the "fishing frog" (*Lophius piscatorius*), often thrown up on the coast of Britain, and conspicuous for the disproportionate size of its head and jaws, and for its general ugliness and rapacity. None of the examples of the gulf-weed *Antennarius* which we have found are more than 50 mm. in length, and we are still uncertain whether such individuals have attained their full size. It is this little fish which constructs the singular nests of gulf-weed bound in a bundle with cords of a viscid secretion, which have been already mentioned as abundant in the path of the gulf-stream.

Scillæa pelagica, one of the shell-less mollusca, is also a frequent inhabitant of the gulf-weed. A little short

tailed crab (*Nautilograpsus minutus*) swarms on the weed and on every floating object, and it is odd to see how the little creature usually corresponds in colour with whatever it may happen to inhabit. Mr. Murray, who has the general superintendence of our surface work, brings in curious stories of the habits of these little crabs. We observe that although every floating thing upon the surface is covered with them, they are rarely met swimming free, and that whenever they are dislodged and removed a little way from their resting place, they immediately make the most vigorous efforts to regain it. The other day he amused himself teasing a crab which had established itself on the crest of a *Physalia*. Again and again he picked it off and put it on the surface at some distance, but it always turned at once to the *Physalia* and struck out, and never rested until it had clambered up into its former quarters.

On Thursday, the 19th, we sounded in 2,750 fathoms in a grey mud containing many foraminifera. Position of the ship at noon, lat. 35° 29′ N., long. 5c° 53′ W.

The wind now gradually freshened, and for the next three days we went on our course with a fine breeze, force from 4 to 7, from the southward, sounding daily at a depth of about 2,700 fathoms, with a bottom of reddish grey ooze. On Tuesday the 24th the trawl was put over in 2,175 fathoms, lat. 38° 3′ N., long. 39° 19′ W., about 500 miles from the Açores. As in most of the deep trawls on grey mud, a number of the zoœcia of delicate branching polyzoa were entangled in the net. One of these on this occasion was very remarkable from the extreme length (4 to 5 mm.) of the pedicels on which its avicularia were placed. Another very elegant species was distinguished by the peculiar sculpture of the cells, reminding one of those of some of the more highly ornamented *Lepraliæ*. WYVILLE THOMSON

(*To be continued.*)

THE FRENCH ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

THE second session of the French Association was opened at Lyons last Thursday, by an inaugural address from the President, M. de Quatrefages, who pointed out the almost inconceivable advance of Science during the past century, and the importance of Science in education.

In speaking of scientific education, the President said that the devotees of literature accused Science of stifling sentiment and imagination; she kills, say they, the ideal and stunts intelligence by imprisoning it within the limits of reality; she is incompatible with poetry. The men who speak thus have never read Kepler the astronomer, Pascal the geometer, Linnæus the naturalist, Buffon the zoologist, Humboldt the universal *savant*. What! says the President, Science stifle sentiment, imagination, she who brings us every hour into the presence of wonders! She lower intelligence, who touches on all the infinities! When *littérateurs* and poets know Science better, they will come and draw from her living fountain. Like Byron of our time, like Homer of yore, they will borrow from her striking imagery, descriptions whose grandeur will be doubled by their truth. Homer was a *savant* for his time. He knew the geography, the anatomy of his era; we find in his verses the names of islands and capes, technical terms like *clavicle* and *scapula*. None the less he wrote the Iliad.

No, the study of Science will never suppress the genius of an inspired poet, of a true painter, of a great sculptor. But she will bring more light to the path of an erring soul. She will perhaps transform into a wise man, or at least into a citizen useful to himself and others, one who without her would only have been one of those pretended incomprehensible geniuses, destined to perish of misery, of impotency, and of pride. While fully admitting the important place of literature in education, he would wish to see children initiated at an early age into the facts, the ideas, the methods of Science.

Governments, such as they have hitherto been, have almost always acted as if they had no need for the men who study Nature and her forces. But when any critical or important event occurs, then it is found necessary to appeal to them. Of whom are the juries of International Exhibitions composed? No doubt each State sends its worthy merchants, its tried chiefs of industry, its eminent agriculturists, but it also, and above all, sends its men of science. At these important times peoples are comparing their real strength, and each feels that it is for its honour in the present and its prospects in the future that the truth should appear; and to enlighten them, whether it be concerning cannons or silk-manufactures, telescopes or crystals, jewellery or hardware, it is felt that Science is indispensable, and men of science are appealed to.

But once the Exposition is closed, the State leaves the men of science to return to their studies. I wish, said M. de Quatrefages, it kept them in the service of their country. These men whom we ask to understand and judge of wonders would certainly be able to show how to produce them. When Science is everywhere, it would certainly not be useless to Government to have it in their power to be enlightened at any time on scientific questions. Although less pressing, less imperious than in the days of peril, the wants of agriculture, of industry, of commerce, like those of the army and navy, do not change their nature. Why wait the necessity for appealing to the *savants?*

A day will come when every great Administration will have its Consulting Committee, composed almost exclusively of men of science, and then many mistakes will be avoided, and many forces utilised which are at present lost. But in order that such an institution should be born and developed, it is necessary that the function of Science be universally comprehended and accepted. To attain this result is one of the chief aims of the French Association.

CHRISTOPHER HANSTEEN

ON the 11th of April last, Hansteen died at Christiania at the advanced age of 88, having been born on the 26th September, 1784. On leaving the cathedral school of Christiania, where he received his early education, he entered the University of Copenhagen in 1802, as a student of law, which, however, he soon abandoned for the more congenial study of mathematics. In 1806, he began his work as a public instructor in the capacity of mathematical tutor in the gymnasium of Fredricksburg, in the island of Zealand, and there he began also his life work as an original investigator by instituting researches into terrestrial magnetism. He first acquired distinction by taking the prize which had been offered for the best essay on this subject, by the Royal Society of Science of Copenhagen; and shortly thereafter, viz. in 1814, was appointed to the chair of Astronomy in the University of Christiania, which had been recently founded by Frederick VI. of Norway.

His great work, entitled "Untersuchungen über den Magnetismus der Erde," was published in 1819, at the expense of the King. This work was illustrated with an Atlas of Maps, and was the most satisfactory collection of observations on the variations of the needle, and was besides distinguished for its broad philosophical generalisations. In the further prosecution of his physical researches, he made his well-known journey into Siberia as far as Kiachta and Irkutsk, accompanied by Erman and Due, the expenses of this journey being liberally defrayed by the Norwegian Government. The establish-

ment, on the recommendation of Humboldt, of the ten magnetical and meteorological observatories, by the Emperor of Russia, was one of the most valuable fruits of this journey.

Among Hansteen's contributions to our knowledge of magnetism, may be mentioned the establishment by him of a period of 11·1 years as the length of the periodicity of the magnetic declination—a cycle which has recently assumed such remarkable significance in connecting astronomical with meteorological and other terrestrial phenomena.

Soon after his return from Siberia, the Government voted the necessary sum for building an astronomical and meteorological observatory at Christiania, which was erected under Hansteen's direction. This observatory has done much good work, of which the meteorological department deserves very special commendation. The trigonometrical and topographical survey of Norway, which was begun in 1837, was conducted under Hansteen's superintendence.

In 1856, the completion of his fifty years public services was celebrated, and a medal was struck in commemoration of the event. Shortly after this he ceased to lecture publicly, and in 1861 retired from public duty.

THE NOTORNIS OF LORD HOWE'S ISLAND

THE last number of the *Ibis* (July 1873, pl. x.) contains a representation of a very interesting bird, about which, though discovered and described in the last century, naturalists have for a long time been doubting. This is the species said to be first mentioned by Callam in 1783 (Voy. Bot. Bay), and subsequently figured in the works of John White (Journ. Voy. New South Wales, p. 238, App.) and Governor Phillip (Voy. Bot. Bay, p. 273, pl.), and designated by Latham (Ind. Orn. ii. p. 768) *Gallinula alba*. No specimens are known to have been brought to Europe for upwards of *eighty* years, and only two are believed to exist in museums—one in that of Liverpool, which was figured by White, and the other in Vienna, now for the first time portrayed. The species is most likely extinct in Norfolk Island, but a passage in a pamphlet by Mr. Edward Hill, published at Sydney in 1870, seems to show that it may still exist in that of Lord Howe—though, if so, doubtless on the verge of extermination through the pigs, with which the island is said to be overrun, for the bird is believed to be unable to fly. Should any examples be still living, it would certainly be better that their remains should be placed in our museums, than that they should contribute to the formation of pork; and I write these lines that they may attract the attention of some Australian readers of NATURE, who may be disposed to do a good turn to the University of Cambridge.

This bird, which has been variously assigned to the genera *Gallinula* (moor-hen), *Fulica* (coot), and *Porphyrio*, is now referred to the genus *Notornis*, containing only one other species, the "Takahe" of New Zealand (*N. mantelli*)—itself nearly, or quite, extirpated. It was about the size of a barndoor-fowl, with the bill and legs red. The Vienneses pecimenseems to be entirely white; the example at Liverpool is mottled with purple, but not enough to gainsay the name of "White Bird," by which it seems to have been known both in Norfolk and Lord Howe's Islands. It would no doubt, if taken alive, be easily kept in confinement, and I need scarcely say how highly a living example would be valued by the Zoological Society; but this is perhaps more than can be reasonably hoped for, and, so far as I am concerned, I should be well content with a specimen in spirit, or a skin with all the bones accompanying it, for the Cambridge Museum.

I may perhaps be allowed to conclude by remarking that the history, and especially the distribution of the family of birds, to which the subject of this notice refers is indeed worthy of far more attention than they have hitherto received, and could that accomplished zoological writer who has lately in the columns of a sporting contemporary made the not very distant family of *Gruidæ* the theme of an admirable series of essays—far probably from being fully appreciated by his readers—be induced to employ his pen on the *Rallidæ*, the results would be of the greatest interest. The Rails—employing the word in a very wide sense—are cosmopolitan in the highest degree. Some of the best known genera have their representatives all over the world, occurring even in oceanic islands, where birds generally are so scarce—*Gallinula* and *Fulica*, for instance; and some at least of the former, when they get to such remote spots, seem to lose their volatile powers, though otherwise undergoing but little change, as witness the *G. nesiotis* of Tristan d'Acunha, made known a few years ago by Mr. Sclater, and a form still undescribed, of which three examples were obtained by my brother from Denis Island, an outlier of the Seychelles group (*Ibis*, 1867, p. 358). Then there is a genus equally flightless, which has lately been restored to light and knowledge, but, alas! too late for us to know it in the flesh. This is the *Aphanapteryx*, which survives only in a few bones, recovered from the mud of a Mauritian lake, and now in the Cambridge Museum, a painting at Vienna, and a few notices by early voyagers—a bird with a long bill and dishevelled plumage, almost, it would seem, like that of the *Apteryx*. In the opposite direction almost, as to structure, we have *Tribonyx;* but I should occupy far too much space were I now to dwell upon even the chief forms of the family. From whatever point of view it be regarded, it will be found one of the most interesting in the whole series of birds.

ALFRED NEWTON

ASTRONOMICAL ALMANACS *

II.

II.—*The "Connaissance des Temps," under the direction of the Academy of Sciences*

THE first to whom the Academy entrusted the editorship of these Ephemerides was Lieutaud.

The only real modification introduced into the volume was the substitution, for the table of refractions published by Lefebvre, of a table of the refractions of Cassini, giving the values of that quantity in minutes and seconds for all degrees of height, from 0° to 90°. The book was also somewhat increased in size. In 1707 Lieutaud introduced into the *Connaissance des Temps* a notice of the occultations of stars, the observation of which is of use in determining longitudes. Lieutaud edited the *Connaissance des Temps* till 1730, when it passed into the hands of a young academician, Louis Godin.

Godin, a pupil of Delisle, was born at Paris on February 28, 1704, and entered the Academy as *élève* at the age of 21 years. He was then known only by a keen desire for knowledge and a strong predilection for astronomy. On taking the direction of the *Connaissance des Temps*, he suppressed the aspects of the planets, which were useless, and introduced the right ascension of the sun for every day of the year; calculated this co-ordinate and the declination to a second, and added the eclipses of the satellites of Jupiter, so that the *Connaissance des Temps* contained from this time the announcement of the eclipses of the superior satellites.

In 1735 Godin set out for Peru for the purpose of measuring with Bouguer and La Condamine an arc of one degree of the meridian, and to Jean-Dominique Maraldi, grand-nephew of Cassini the elder, was committed the care of the *Connaissance des Temps*. He enriched the work with the configuration of the satellites of Jupiter for every day in the year, but he suppressed the notice of occultations,

* Continued from p. 314.

a great mistake, certainly; though perhaps these phenomena were of little service in his time. Having become a *pensionnaire* of the Academy in 1760, he resigned the editorship of the *Connaissance des Temps* to Joseph-Jerôme Le François de Lalande.

De Lalande, born at Bourg-en-Bresse, July 11, 1732, was sent at the age of 20 to Berlin, under the patronage of Le Monnier, his master, to take observations of the moon, which, combined with those which La Caille at that time effected at the Cape of Good Hope, were the means of giving the parallax of that planet. On his return he was presented to a place vacant for many years in the Academy, and shortly after, in 1760, he was entrusted with the editorship of the *Connaissance des Temps*. A distinguished astronomer, possessing a thorough knowledge of all the advances which had been made during later years in astronomical science, Lalande very much improved the work of which he had charge. We shall mention the most important of the changes which are due to him.

His first care was to take for the basis of his calculations new tables, more exact than those which Godin had continued to employ. He employed for the sun the tables of the Abbé of La Caille; for the moon, those of Tobie Mayer*; for the planets, the tables of Cassini; and for the eclipses of the satellites of Jupiter, those of the Swede Wargentin, of which he had published a new edition. The rising of the sun and the planets is calculated for the true noon of each day; but, says Lalande, "the *Connaissance des Temps* being intended mainly for astronomers, the positions of the moon are given for the instant of her passage across the meridian." The following year, however, "on account of the inconveniences attending such a mode of indication," this astronomer resolved to give the longitudes for midday and midnight of each day. Finally, in a short and well-written memoir appended to the *Connaissance des Temps*,† he investigated the different methods for finding the longitude at sea by a single observation of the moon. Some years later he restored the announcement of the occultation of stars.

In 1774, the *Connaissance* received from Jerôme Lalande a most important improvement, which was the means of making this work, hitherto almost exclusively intended for astronomers, of great use to mariners. But, before stating in what this modification consisted, some historical details are necessary concerning one who was the real pioneer, and at the same time one of the glories of French astronomy in the 18th century.

In 1737, the *savant* Fouchy presented to Cassini of Thury, son and successor of the first director of the Observatory of Paris, celebrated for his fine work on "The Size and the Figure of the Earth," a young deacon of 23 years, who, alone, without instruments and almost without books, had acquired a remarkable astronomical education. Cassini welcomed the *protégé* of Fouchy, lodged him at the Observatory, and allowed him to take part in his work. This young Abbé was Nicolas-Louis de la Caille, born on March 15, 1713, at Rumigny, near Rozoy, in Thiérache. J. D. Maraldi, grand-nephew of Cassini the first, and who also lived at the Observatory, became his friend, and a year after his arrival (1738), La Caille made along with him the geographical description of the coast of France, from Nantes to Bayonne; in 1739 La Caille took part in the work connected with the meridian of France.‡ Shortly after, Dr. Robbes nominated him professor of mathematics at the Mazarin College. He instituted a small observatory where he made a very large number of observations of rare precision. In 1741, at the age of 27 years, La Caille entered the Academy of Sciences.

In 1744 the astronomer of the Mazarin College published the first volume of a series of Ephemerides, entitled "Ephémérides des monuments célestes depuis 1745 jusq'en 1754," in which he was the first to give—and Lalande afterwards imitated him in the *Connaissance des Temps* of 1760—the distance of the sun at the equinox, or, what amounts to the same thing, the right ascension of the sun in time.

Some years later, in 1749, La Caille proposed to the Academy that he should spend a year at the Cape of Good Hope, for the purpose of making an accurate catalogue of the stars of the southern sky, intended to replace the first rough sketch made in 1677, by Halley, at St. Helena; to measure the parallax of the moon, of Venus, and of Mars, by means of comparative observations made simultaneously in Europe; and finally to determine carefully the geographical position of the Cape of Good Hope.*

The proposal of La Caille was adopted, and the States-General of Holland having given their assent, La Caille set out in 1751, after having published the list of stars which he wished to be observed by the European astronomers, for the purpose of rendering his voyage fruitful in scientific results. We do not intend to recount all the incidents of this expedition. Let us, however, mention a fact which illustrates well the character of this astronomer, "reserved, modest, and disinterested." He received for his expedition, the purchase of instruments, and other expenses, for his maintenance and that of an artist, the sum of 10,000 livres; on his return, he found he had spent only 9,145 livres. He scrupulously carried back the balance to the royal treasury; the officials, surprised, would not accept it. "You require it," they said to him; "it will take it to remunerate you." Moreover, when he set out from the Cape, the minister had charged him to make maps of the Isles of France and of Bourbon, which were not comprised in the original plan, and "for which most others would have asked, and certainly obtained, a supplementary indemnity."†

The observations made during this expedition (1751 and 1752) by La Caille with his telescope of 26 inches focus, and an inch and a half aperture, were published by himself, and after his death, by Maraldi, in 1763, under the title, "Cœlum australe stelliferum, seu observationes ad construendum stellarum Australius catalogum institutæ, in Africa ad Caput Bonæ-spei, à Nicolao-Ludovice De La Caille."

A new edition of this catalogue was published in 1847, under the superintendence and at the expense of the British Association and the British Government, under the editorship of Messrs. Bailly and Henderson, the latter, at the time, Director of the Edinburgh Observatory.‡

But, besides, this voyage to the Cape of Good Hope had a most important result. During the two journeys, La Caille tested and compared all the methods employed till then to determine longitude at sea. Among these he noted that which the celebrated Halley had given in 1678, and which is based upon the observation of the distance of the moon from the sun or from a star. The experiments which he made in reference to it having convinced him of its excellence, he strongly recommended it on his return to France; and in his second volume of Ephemerides, which commenced in 1755, he proposed a Nautical Almanac, in which should be found, for every hour of the

* "Tabularum motuum solis et lunæ et longitudinum methodus pro mota.'

† Lalande afterwards regularly followed the custom of accompanying the *Connaissance des Temps* with short astronomical memoirs, entitled "Additions to the *Connaissance des Temps*." This custom has continued to the present day.

‡ The work done by Cassini de Thury, Maraldi, and La Caille, was published by La Caille in 1744, and bore the name of Cassini de Thury.

* La Caille also purposed to observe the length of the seconds pendulum, the variation of the magnetic needle, and finally the length of a degree of the meridian at the Cape. This has since been measured under the equator, under the Polar Circle, and in various places in Europe; but we do not yet know the value of any degree in the southern hemisphere.

† In the accounts which he rendered on his return, La Caille has put down only *five sous* for his daily expenses, and as much for those of a mechanician who accompanied him.

‡ The Association gave 200*l*. and the Government 1,000*l*. It is entitled "A Catalogue of 9,766 Stars in the Southern Hemisphere for the beginning of the year 1750, from the Observation of the Abbé de la Caille."

day, the distance of the moon from the sun and the stars. La Caille regretted that his other occupations would not permit him to compile this nautical Ephemerides himself. At a later time, in his treatise on navigation, he reverted to the same subject, and gave anew the sketch of his almanac, limiting himself to giving the distances every four hours for the meridian. His design was not followed. Lalande contented himself with analysing and discussing La Caille's method in the *Connaissance des Temps* for 1760. As to the French Marine, it was content to use "L'état du Ciel, calculé par Pingré et rapporté à l'usage des marins, 1754, 1755, 1756, et 1758." It was very different, however, in England.

(*To be continued.*)

SOUTH AFRICAN MUSEUM

THE *Cape Argus* for July 10 contains the report of the curator, Mr. Roland Trimen, of the South African Museum, for the previous half year. Many valuable additions have been made to the museum during that time, but its efficiency is very seriously crippled through want of funds, mainly due, we are sorry to say, to the parsimony of Government. We regret to see that the number of subscribers has seriously diminished from what it originally was, but the success of so valuable an institution should in no way be dependent on the capricious revenue to be derived from such a source. Let us hope that recent changes in the *personnel* of the Government will lead to greater liberality for this and for other scientific purposes. We cannot do better than give a few extracts from an excellent leader in the *Argus* on the Curator's report.

"Now that strong efforts are being made to forward the interests of education in the Colony, those institutions that aid in the work should not be neglected. We do not at present refer to colleges and schools, for these, whenever education is discussed, come prominently before the popular mind, but our remarks are directed rather to such places as museums, whose work in higher education of the kind required in modern days is of considerable importance . . . It has often struck us as rather a reflection on Cape Town that there is no Society here for the discussion of natural science subjects, and though we are aware of some obstacles to the successful working of such a body, we see no reason why they should not be overcome. In the capital of every Colony of which we have any knowledge, a Society of the kind exists, and indeed in the Cape itself there are towns that, in this respect at least, are ahead of the metropolis.

"But though we have no Natural Science Society in Cape Town, we have what, all things considered, may be said to be an excellent Museum. . . . The Museum was founded under the enlightened influence of the then Governor, Sir George Grey, in 1855, and in 1857 was incorporated by Act of Parliament. Its first trustees were Mr. Rawson, the Colonial Secretary at the time, Sir Thomas Maclear, the then Astronomer Royal, and Dr. Pappe, the then Colonial Botanist. On Dr. Pappe's death Mr. C. A. Fairbridge was appointed a trustee, and upon the resignation of Mr. Rawson, on his departure from the Colony, his place was filled by Mr. Southey, now Lieut.-Governor of Griqualand West. It will be thus seen that the Museum has from the first been under the management of trustees alike of scientific acquirements and business ability. In its first curator, Mr. Layard, it was extremely fortunate, and it had the advantage of his enthusiastic labours for the lengthy period of fifteen years.

"But though it has had the advantage of excellent management, the development of the institution has been seriously hindered from want of funds, and it has not received, either from the Legislature or the public, that pecuniary support necessary to secure the services of efficient officers and to meet the thousand and one expenses of cases, glass, chemicals, and the appliances and apparatus required in carrying out the work of a museum. It is a wise policy on the part of the Legislature to vote grants of money to such institutions in proportion to the pecuniary support received from the public, and if Parliament is to be induced to make a larger grant to the Museum, the private subscription list must be extended. The small sum of one guinea represents the subscription for a year, and we are quite sure, when it is known how much the institution stands in want of funds, the list of subscribers will become larger.

"Strangers who visit the Museum and who know how such things are managed elsewhere must smile when told that its curator is a clerk in the Civil Service, whose time is chiefly occupied in doing the work of a subordinate officer in the Colonial Office. We say this without any intention of disparaging the gentleman referred to, for his attainments in one branch of Science at least are universally admitted; but we do say that, if the South African Museum is to be anything like worthy of the name, and if it is to continue efficiently to perform the work so well commenced by Mr. Layard, its curator should devote the whole of his time and attention to the duties of that office. Under existing circumstances, that, however, is not to be expected, as the salary is not sufficient to induce any qualified gentleman to give up other positions for the sake of applying himself entirely to the work of the Museum.

"There are other matters connected with this institution to which we might draw attention, but until more public support is given to the Museum it would be a waste of time to refer to them."

GEOLOGICAL MAP OF AUSTRALIA AND TASMANIA*

GEOLOGICAL surveys have been proceeding, to a greater or lesser extent, in all the Australian colonies for several years, and in Victoria the work has been prosecuted so systematically, and with such success, that the main features of the surface geology of the country are comparatively well ascertained and mapped out. The example in this respect set by Victoria has been followed to a very considerable extent by Queensland, and in a lesser degree by several of the other colonies. A geological map of Australia has, however, never been issued. Such a work would be invaluable, and the materials obtained are quite sufficient to justify an attempt being made to carry it out. Such an attempt is now being made by the Mining Department of Victoria. Some months since the Hon. A. Mackay, Minister of Mines, put himself in communication with the Governments of the other colonies with the view of obtaining from them all the information in their possession respecting the geological characteristics of the territories over which they presided. The application was readily acceded to, and a large mass of materials has been since placed at the disposal of the Mining Department of Victoria. Under the direction of Mr. R. Brough Smyth, F.G.S., Secretary for Mines, this has been thoroughly digested and arranged, and is now being embodied in a map, which, when completed, as it will be shortly, will show at a glance the result of all geological surveys made in Australia and Tasmania up to the present time. As the value of such a work necessarily depends upon the accuracy of the observations upon which it is based, it may be well, before attempting a brief description of its main features, to indicate the source from whence the materials used in its compilation have been derived. The geological sketch

* From an article in the *Melbourne Argus*, July 7.

map of Victoria, exhibited by the Mining Department at the late Intercolonial Exhibition, and which contains the results of the latest surveys made in the colony, will be embodied in the general map. It was compiled by Mr. Brough Smyth from surveys made some years ago under the direction of Mr. A. R. C. Selwyn, at present director-general for the Geological Survey of Canada, but who formerly held a similar position in this colony, and from surveys made since by the officers of the mining department. It has been described "as the nearest approximation that can at present be made to a true representation of the rock masses which are exposed in this colony." The New South Wales Government have in preparation a geological map, which, it is expected, will be available for use before the general map is published.

The Queensland Government has been keenly alive to the importance of mapping out the immense mineral districts of that colony, and for some years has kept a staff of geological surveyors actively employed in the work. The information thus collected has been embodied in a series of elaborately-coloured and beautifully-executed maps, which have proved of great service in the compilation of the general map of Australia. An excellent sketch map, covering a considerable portion of the colony, has been obtained from the Government of South Australia. It was compiled under the direction of Mr. A. B. Cooper. It is especially valuable, as it embraces a great part of the populated districts. The country north of Encounter Bay, the most extensive mineral district in the southern portion, was examined and reported on by Mr. Selwyn many years ago, and a sketch map prepared by him is being used in compiling the new map. The same district has been very recently reported upon by Prof. Ulrich, at the request of the Government, and his observations are proving of great assistance.

Thanks to the energy of Mr. C. Gould, a son of the eminent naturalist, the geological characteristics of Tasmania were very accurately delineated during the time he was geologist for the colony. An excellent map was published under his direction, and he voluntarily made a number of additions to it a short time ago, when he learnt that a copy was to be transmitted to Victoria to be used in the preparation of the general geological map of Australia.

A large portion of the vast territory of Western Australia has been surveyed by Mr. H. Y. L. Brown, Government surveyor, but who was once attached to the geological staff of Victoria. This gentleman has produced a very beautiful sketch map of the S.W. portion of the colony, which has been extensively used by the compiler of the new map. It thus appears that every care has been taken to obtain the most accurate information at present available.

An examination of the map discloses facts of interest not only to geological students but to the public at large. The value of the map to men engaged in mining is too palpable to call for comment, as it shows at a glance the formations in which the precious metals occur. In rocks belonging to the primary or palæozoic group, gold, tin, antimony, silver, lead, and copper may be confidently searched for. The secondary or mesozoic rocks contain coal, while tin is frequently found associated with granitic rocks. Persons engaged in pastoral and agricultural pursuits will also derive advantage by consulting this map. A very little geological knowledge will tell them that in districts where the principal rock masses belong to the tertiary period they may look for well-grassed plains suitable for pasture. In areas where the volcanic rocks abound, rich soil, well adapted for agricultural pursuits, may be expected. The slatey ridges formed by the older silurian rocks, and the sparsely grassed mountains of granitic rock which abound in Western Australia, also convey a valuable lesson to the intelligent observer. One of the most prominent geological facts which the map discloses is, that a great metalliferous belt lies on each side of the main Cordillera from Cape Yorke to the southern point of Tasmania. It is composed chiefly of metamorphosed schists and granite rocks overlain in a considerable area by the newer palæozoic rocks and mesozoic coal-bearing strata. Another great belt appears to extend from Encounter Bay in South Australia towards the Gulf of Carpentaria. North of the 30th parallel of latitude the schists are overlain by tertiaries, and what Mr. Daintree considers to be rocks of the cretaceous age up to lat. 20° to 23°, where a large patch of metamorphic schist occurs. The whole tract west of the eastern metalliferous belt is occupied by tertiaries. Wide treeless plains, and what are called desert sandstones, abound. The vast tract of country known as Central Australia will have to be marked "unknown," as geological surveys have not yet been made of it. What is at present known of the geological character of the northern portion of South Australia will be mapped out. The Government of South Australia have furnished a very good map showing the palæozoic tract of Port Darwin, and from notes made by explorers the department has been able to lay down a large granitic tract also, as well as a large area covered with rocks of volcanic origin. The coal rocks are seen extending all along the coast from Port Curtis, in Queensland, in an almost unbroken line to Eden or Twofold Bay. They are especially prominent at Newcastle and Wollongong, in New South Wales. They again appear north of Corner Inlet, at Cape Otway, and can be traced in broken patches along the coast up to Glenelg, where they apparently terminate. Another interesting fact established by the new map is, that within the tertiary era connection has existed between Tasmania and the main land. There is a strict resemblance between the geology of Tasmania and the continent, and the chain of granite islands extending from Wilson's Promontory, the southernmost point of Australia, to Cape Portland, the northernmost point of Tasmania, have all their ridges capped with tertiaries, thus showing that within the tertiary period the island and the continent must have been connected. The main geological characteristic of Western Australia is the immense area occupied by granitic rocks, varied occasionally by patches of sandstone, especially on the southern coast line. A comparatively small part is occupied by a belt of metamorphic rocks to the east of Champion Bay. Volcanic rocks are also visible. A large granitic tract occurs in the basin of the Shaw River, east of Dampier's Archipelago. It appears that there has been a greater amount of denudation on the western side of the continent than on the eastern. Where the altitude is that of the Dividing Range, which varies from about 1,500 ft. to 7,000 ft., either granite, metamorphosed schists, or silurian rocks are found. Underneath the basalt or volcanic rocks in Queensland, as well as at Ballarat, the deep leads occur. It is curious to note that the deep leads of Queensland contain tin as well as gold. Wherever the dark red patch appears indicating granite, tin may be expected to be found. The extraordinary richness of the tin deposits of Queensland and New South Wales will probably cause the immense granitic tracts of Western Australia to be thoroughly explored. The middle belt of metamorphic schists which occurs in South Australia is as well known for its extensive copper mines as the eastern belt is for its gold.

The Mining department of Victoria has established a high reputation for the general excellence of the geological maps it has produced. The last effort will reflect equal credit upon the officers employed upon it. The rocks are shown in a descending order, and are easily recognised by the distinguishing colours with which they are tinted. A system of lettering the face of the map has also been adopted, which will fa-

cilitate the rapid identification of the rocks. In general appearance the map will more closely resemble those prepared in Germany or France than those compiled in England. As already mentioned, the responsible and onerous task of reducing the mass of materials obtained from so many different sources, and embodying the results of so many months of patient investigation, in the new map, has been performed by Mr. R. Brough Smyth. Mr. A. Everett, a draughtsman employed in the Mining department, has been entrusted with the duty of colouring the map, and Mr. R. Shepherd has performed the difficult work of colouring it on stone.

NOTES

SIR SAMUEL and Lady Baker arrived at Cairo, last Sunday. All was well.

THE twenty-second session of the American Association for the Advancement of Science commenced its meetings at Portland, Maine, on Wednesday, 20th inst. Prof. Lovering, of Cambridge, is president for the year.

THE discovery is announced, from America, of another small planet, No. 133, by Prof. Watson, of the Ann Arbor Observatory.

THE session of the Iron and Steel Institute at Liége was brought to a close on Thursday, on which evening the King of the Belgians gave the members a grand reception at Brussels. There was an interesting discussion on Wednesday morning between Mr. Bulgenbach and Mr. Bell at the Institute, on the subject of the construction of high furnaces. Papers were read relative to various technical matters, and the President read a paper upon the extension of commercial relations with China. In the afternoon more than 450 excursionists paid a visit to the factory of Messrs. Cockerill at Seraing. Several speeches were made, and the visitors, who were most cordially received, remained four hours. It has been decided that the Congress should meet in 1874 in Philadelphia, and in 1875 in England. A very interesting paper was read at one of the meetings by M. Julien Deby, C.E., "On the Rise and Progress of the Iron and Steel Industries in Belgium," in which he said :—"We are very ignorant of the state of things in this country prior to the arrival of Julius Cæsar. Archæological discoveries of quite recent date, still unpublished, seem to indicate that at the period of the great Roman conqueror's invasion Iron had already been made in Belgium, while it was yet unknown to the inhabitants of the British Islands. The oldest records we have consist in vast deposits of cinder which cover many acres of ground, and are situated at Niew Rhode, between Louvain and Aerschot, in Brabant, as well as at Tessenderloo, in the Antwerp campagne, where they generally occupy the top of the many ferruginous hillocks of that region. Along with these accumulations of iron cinder are found flint arrow-heads and fragments of coarse pottery, characteristic of the earliest dawn of civilisation, and which must have belonged to the old pre-historic workers of these deposits. At a later period, and during the Roman dominion, iron was produced in very many places in Belgium. Immense heaps of cinder are to this day scattered in many parts of the country, and several of these are being profitably worked in the neighbouring blast furnaces."

THE meetings of the British Archæological Association at Sheffield were brought to a close on Saturday. The time has been spent by the members in visiting most of the places of archæological interest in the district during the day, and in listening to papers read in relation to the places visited, as well as on other subjects. On Wednesday night, at a *conversazione* in the Cutlers' Hall, Mr. R. N. Phillips read a paper on the "Manufacture of Hardware by Celts and Romans," illustrated by fine specimens in bronze of various degrees of advancement, a baked clay melting-pot, and a bronze ingot. He adduced evidence of mining and smelting by Romans, and stated their wood-smelted iron to be of unequalled malleability. He suggested that the Romans held Britain for the sake of its mineral wealth; their extensive beds of scoriæ in the Forest of Dean were still so rich in iron-stone that they were being re-smelted. Mr. T. Morgan read a paper on the "Earliest Tribes of Yorkshire," and Mr. Alfred Wallis one on the "Pre-historic Remains on the Derbyshire Borders."

AT the meeting of the Somersetshire Archæological and Natural History Society held at Wells last week Dr. Beddoe gave a brief sketch of the ethnological history of the county, and showed its bearings upon the physical aspect of the population at the present day. We learn from the paper that the people of the eastern half of the county have, on the whole, broader heads, lighter hair, and darker eyes than those of the western half. In all these respects the eastern men approach more to the ordinary English, the western to the Irish, standard. The mixed blooded inhabitants of the towns appear to be lighter as to both eyes and hair than the people of either division. The fair and handsome Frisian type is pretty common in the north of the county. In the hilly south-eastern region about Wincanton dark complexions and dark or even black hair attest the late and imperfect Saxonisation of the country; the same may be said of the Quantocks. About Minehead and Dunster, perhaps from the less fixity of the population induced by seafaring, there is more evidence of mixture of blood; and in Exmoor and in some villages of Mendip the narrow skull, prominent jaws, and bony frame of the Gaelic type and the Turanian oblique eye and pyramidal skull crop up.

DR. BELL PETTIGREW, F.R.S., has been appointed Lecturer on Physiology at the School of Medicine, Surgeons' Hall, Edinburgh.

THE Secretaries of Section C (Geology) of the British Association request the attention of authors to the rule requiring the early transmission of papers. In order that the work of the Organising Committee may be completed in time, all papers and reports, accompanied by abstracts, should be forwarded to the General Secretaries not later than September 4.

WE are indebted to Mr. G. Gore, F.R.S., for a copy of a reprint of an able article of his on the "National Importance of Scientific Research," which appeared in a recent number of the *Westminster Review*. We are glad to have the opportunity of drawing attention to Mr. Gore's paper, as it forcibly expresses the view we have so persistently advocated in our own columns. Mr. Gore, after showing that the pursuit of pure Science is rarely rewarded in this country, points out that it is the duty of the State to provide and pay for pure scientific research, for the following reasons :—"Because the results of such labour are indispensable to national welfare and progress; because the results are of immense value to the nation, and especially to the Government; because nearly the whole pecuniary benefit of it goes to the nation, and scarcely any to the discoverer; because research cannot be efficiently provided for by means of voluntary effort; and because there appears to be scarcely any other way (except by application of University revenues) in which discoverers can be satisfactorily paid for their labour." At present, as the writer states, the men paid the highest are not those who discover knowledge, but those who use and apply it. The reason for this apathy of the public as regards scientific work is, as Mr. Gore shows, clearly traceable to a widespread and lamentable ignorance of the nature and value of scientific inquiry. To diffuse natural knowledge among all classes of society is therefore a great duty at the present time.

THE Philadelphians are hard at work preparing for their Centennial Exhibition to be held in 1876. 200*l.* each for the ten best designs for an appropriate building had been offered, and forty plans have now been sent in. The Centennial Commission having in charge the inauguration and conduct of the Great Exhibition, have already made most commendable progress. Committees from their number, having in charge special departments of the vast scheme, are in constant session, and the general outline of the work seems to have been fully developed. The site for the buildings used for the occasion has already been selected in Philadelphia's beautiful park, and the formal transfer of the ground by the city authorities to the control of the Centennial Commissioners took place, with the imposing ceremonies befitting the occasion, on July 4. The decoration of the ground for the purpose, the planting of shade trees, &c., will be taken in hand at once.

AMONG the appropriations made by the State of New York for the State Cabinet of Natural History are the following enumerations:—Hall of Natural History, cleaning, repairs, &c., 3,000 dols.; for the increase of the zoological collection, 1,000 dols.; assisting in arranging duplicate fossils and minerals for distribution, 1,500 dols.; salary of botanist, 1,500 dols.; for the use of the Cabinet of Natural History, 10,000 dols., making an aggregate of 17,000 dols. The Board of Regents of the University receive 6,500 dols.

THE offer of free lodging in the Rudolphinum during the Exhibition at Vienna has been responded to by no fewer than 2,412 teachers. Of these 418 have been selected, viz.:—207 Austrians, 99 Germans, 36 Italians, 20 Englishmen, 14 Dutchmen, 13 Swedes, 12 Danes, 10 Swiss, 7 Russians, 3 Belgians, and 2 Spaniards.

THE Committee appointed by the Birmingham Natural History and Microscopical Society to carry out the proposed Marine Excursion have, as nearly as possible, completed all the necessary arrangements. A yacht has been hired for six days, commencing Sept. 1, for a very moderate sum. Mr. A. W. Wills has made a large-sized dredge, which he has kindly presented to the Society. The small dredges belonging to the President and Mr. Wills will also be available for the excursion. With the view of rendering the dredging operations scientifically interesting and valuable, it is proposed to use a Miller-Casella thermometer with copper case, similar to those supplied for the *Porcupine* and *Lightning* expedition. Dredging operations, and the management of the yacht, will be entirely under the direction of the President and Mr. Wills, who will determine the hours of sailing and returning, the places to be visited, &c. &c. In addition to those made in the yacht, excursions to places of interest in the neighbourhood will be planned at intervals during the expedition. Very satisfactory arrangements have been made as to accommodation. The proposed excursion is an experiment which, if successful, may be repeated on a larger scale at some future time.

THE United States screw steamer *Juniata*, of 828 tons burden, left New York on the 24th of June, bound to Greenland, on her mission of rescue to the crew of the *Polaris*. She is in charge of Commander Braine, with a picked crew, and has been fitted out with every appliance needed for the success of her object. She reached St. Johns, Newfoundland, on June 30, and immediately went into the dock for the purpose of being properly sheathed with iron, and otherwise strengthened and refitted. As soon as this was completed she left for Disco, on July 9, where, or at Upernavik, she will wait until the arrival of her consort, the *Tigress*. The *Tigress*, it will be remembered, is the Newfoundland sealing steamer which rescued a part of the crew of the *Polaris* from the ice, and was purchased by the Secretary of the Navy as a relief vessel for the remainder of the party, as being better fitted for this end than any vessel that could be properly prepared in time for departure during the present summer. She reached New York on June 28, and was immediately examined by proper officers of the navy, who decided at once what alterations and repairs to put upon her. The *Tigress* is 165 ft. in length, has 28 ft. breadth of beam, and 16 ft. depth of hold, draws 13 ft. of water, and has a capacity of 463 tons. She has been placed under Commander Greer, lately of the Naval Academy, and is accompanied by Captain Tyson, late of the *Polaris*, as ice-master. The *Tigress* left Brooklyn on July 14, and arrived at St. Johns on July 23, where, like the *Juniata*, she will take in additional supplies, and then proceed northward. She is prepared to remain two years in the North if necessary, although it is hoped that she will return during the present season, convoying the *Polaris*.

THE second annual report of the Board of Commissioners of the Department of Public Parks in New York, is partly devoted to the condition of the Menagerie in Central Park, which has increased considerably in size during the last year. A catalogue is appended of the animals contained in the collection, which is on exactly the same plan as Mr. Sclater's carefully constructed List of Animals in the Zoological Society's Gardens in Regent's Park.

IN Part V. of Dr. Brown-Sequard's new "Archives of Scientific and Practical Medicine," there is an excellent analysis of some of the recent researches on the localisation of the cerebral functions, including an account of the experiments of Nothnagel, Gudden, and others. We hope next week to be able to give an abstract of the paper.

THE death of the Rev. Peter John de Smet, of the Society of Jesus, is announced as having taken place at St. Louis on May 23—an event which is worthy to be noted in a scientific point of view. Although not himself a special student of natural science, numerous collections made at his request and under his direction, and transmitted to museums at home and abroad, have borne witness to his tastes; and it is even stated that he has left behind him a manuscript record of his life, in which are embraced important notes of the habits and customs of the Indian tribes of the West, and of the physical condition and natural history of the regions inhabited by them.

THE Fourth Part of the illustrated work by Mr. Hermann Strecker, of Reading, Pennsylvania, upon the Lepidoptera has just been published, and contains figures and descriptions of quite a large number of species, illustrated by one plate. Among other species is included a new butterfly (*Satyrus hoffmanni*), obtained by Dr. Hofmann at Owen's Lake, in Nevada.

THE *Journal of the Society of Arts* for August 22 contains a report on steel as represented at the International Exhibition, by Mr. William Baker.

A LETTER appears in the *Times* of Tuesday, from Mr. Richard Potter, one of the party from Mr. Leigh Smith's Arctic Expedition, by the Spitzbergen route. It is dated Trenerenberg Bay, July 4, and says:—"The *Polhem* came in here last night, and is going away again to-day. She is going home in about three weeks, I believe. We fell in with the *Samson* two days ago. We have been up to the Seven Islands, lat. 80° 50′, but there is too much ice to go farther North at present. Prof. Nordenskiöld and the other men who tried to get North in boats could not get farther than 80° 35′ lat., and then, finding the ice too rough for sledging, crossed the north-east land, and returned by Hinlopen Straits. They must have had a bad time of it, as there were

snowstorms fifty out of sixty days. The bay where we are now is where Parry left the *Hecla* when he went North on sledges. It is anything but a fertile place, as the low ground is all one great swamp, and there is a lot of snow on the ground still. We are going to stop here to take in water, and to get the provisions and coals out of the *Samson*."

THE additions to the Zoological Society's Gardens during the last week include a Naked-footed Owl (*Athene noctua*), European, an Egyptian Vulture (*Neophron percnopterus*), and two Buzzards (*Buteo tachardus*), from Africa, presented by Mr. S. G. Reid and Lieut. Denison; a Golden Eagle (*Aquila chrysaëtus*), European, presented by Mr. A. W. Tait; a Paradoxure (*Paradoxurus typus*) from India, presented by Mr. A. F. Adey; a Mantchurian Crane (*Grus montignesia*) from N. China; a Wild Pig (*Sus scrofa*) from N. Africa; three Common Guillemots (*Uria troile*), British; a White-backed Piping Crow (*Gymnorhina leuconota*) from Australia, deposited, and four Gambel's Partridges (*Callipepla gambelii*) hatched in the Gardens.

SCIENTIFIC SERIALS

Der Naturforscher for July 1873, contains, among other interesting matter, an account of observations by Herr Nägeli, among plants in Alpine regions, as to the production of closely-related plant forms. He is led to conclude, (in opposition to the common view), that association is more favourable to the formation of species, than isolation. There are also botanical papers on the assimilation of air-plants under water, and the opening and closing of flowers. In physics and chemistry we have M. Amagat's recent important experiments on the expansion and compressibility of gases, and those of Troost and Hautefeuille on isomeric and allotropic transformations; a notice of M. Bichat's investigation of the influence of aggregate state on magnetic rotatory power, &c. M. Bichat has ascertained a decrease of this power as temperature rises, and entire disappearance of it in the state of vapour. Some striking facts with regard to the meteorological differences between northern and southern hemispheres are from a paper by Prof. Dove to the Berlin Academy. In physiology there are notes on the place of decomposition of albumen in animal bodies, and on the significance of common salt in the animal economy. Astronomy and technology are also represented, and there is a good selection of *Kleinere Mittheilungen*.

THE current number of the *Ibis* commences with an article on the "Ornithology of Sardinia," by Mr. A. B. Brook, which is one of a series on that subject. The part before us includes the Woodpeckers, their allies, the Swifts, and some Passerine birds, among which are *Melizophilus sardus*, *Bradypterus cetti*, and the Corvine birds. Mr. R. Swinhoe describes the habits and plumage of the Rosy Ibis of China and Japan (*Ibis nippon*). He also notes points in its visceral anatomy, comparing them with the corresponding structures in the common Heron, in order to show that the affinities supposed by some to exist between the two birds are but slight. An editorial note verifies the conclusion that the Ibis and Spoonbill are intimately related, and differs justly from the author's conjecture that the former bird is related to *Tantalus*, which is a true Stork.—Mr. J. H. Gurney gives a tenth additional list of birds from Natal, including several species from the rich collection of Mr. R. B. Sharpe. Mr. J. E. Harting contributes a paper on *Charadrius pecuarius* of Temminck, in which it is shown that this bird is the smaller of the two allied species inhabiting Africa, but not found in St. Helena, and that the St. Helena species, till now unnamed, is distinct (*Aegialites sanctæ helenæ*, Harting). Vieillot's name, *Ch. varius*, must also take precedence of Temminck's *Ch. pecuarius*. An illustration is given of each of the birds referred to.—Messrs. Salvin and Elliot, in continuation of their notes on the *Trochilidæ*, discuss the genera *Pygmornis*, *Glaucis*, and *Threnetes*, separating the first into three groups, from the second removing *G. dohrni* to the genus Grypus, as already suspected by Mr. Gould, and adding *Glaucis ruckeri* to the third. The same ornithologists help to clear the synonomy of *Lophornis gouldi* by naming *L. reginæ* of Gould, *L. strictolophus*.—Mr. T. Ayres continues his notes on birds in the republic of Trans-Vaal, and Mr. G. N. Lawrence on the Cuckoos of the genus *Neomorphus* defines precisely *N. geoffroyi*, *N. salvini*, *N. rufipennis*, and *N. pucherani*, showing that the specific validity of the last-named has been questioned by several distinguished ornithologists; though some time ago, Mr. Sclater, on seeing the type-specimen, was convinced of its being an excellent species.—Mr. Salvin figures the typical specimen of *Fulica alba* of White, showing that it is evidently of the genus *Notornis*, as pointed out by Herr von Pelzeln.—The Viscount Walden, P.Z.S., describes, as the last paper, a collection of birds from the Andaman Islands, made by Lieut. R. W. Ramsay; figuring *Centrococcyx andamanensis*, *Kittacincla albiventris*, *Sturnia andamanensis* and *Jynthænas columboides*, also entering into detail with reference to *Spilornis elgini*.

SOCIETIES AND ACADEMIES

RIGA

Society of Naturalists, March 5.—Dr. Petzholdt concluded a series of five lectures on Turkestan, having described the fauna and flora, ethnographical features, dwellings, manners and customs, state of agriculture, mining and manufacture, &c. He commends the mode of treating silkworms as superior to that in Europe, and thinks the system of irrigation more perfect than in any other land not having scientific appliances. The Russian portion of Tasckkent, it is stated, has now a good chemical laboratory.

The *Correspondenzblatt* (No. 6) contains a note on uncommon forms of hair-growth, with reference to two Russian peasants exhibited before the Society in December.

March 19.—Herr Berg gave an account of his excursion to Kurland, and the plants and mollusca he met with.

March 26.—Dr. Nauck described an electrical experiment. A funnel with leather bag at the end is placed in a long glass cylinder, and has mercury poured into it. The liquid streams through the pores against the glass sides, and runs down. The lower part of the cylinder and the mercury in it are found positively electric, while the upper part and the funnel with its mercury are negative. The limit between positive and negative, after some variation, divides the cylinder into two parts, of which the lower is double the upper.

April 2.—Dr. Schell reported on the present arrangement of the meteorological station of Riga, and on observations of the water-mark at Riga and at Duna mouth in 1872.

BOOKS RECEIVED

FOREIGN.—Remarks on Synonyms of European Spiders: Prof T. Thorell (Upsala).—Lehrbuch der Physik, Dritte Lieferung: Dr. Paul Reis (Leipzig).

ENGLISH.—Gateway to the Polynia, a Voyage to Spitzbergen, from the Journal of J. C. Wells, R.N. (H. S. King & Co.).—Sound and Music: Sedley Taylor, M.A. (Macmillan & Co.).—Echoes from distant Footfalls: Rev. J. Boyes (Hodder & Stoughton).—Man a special Creation: William Sharpe, M.D. (R. Hardwicke).—Introduction to Physical Measurements: Dr. F. Hohlrausch (J. & A. Churchill).—Mitchell's Manual of Practical Assaying; Edited by Wm. Crookes (Longmans & Co.).—Descriptive Sociology, Classified and arranged by Herbert Spencer (Williams & Norgate).—Introductory Text Book of Geology: David Page, LL.D. (W. Blackwood & Sons).—Advanced Text Book of Physical Geography: David Page, LL.D. (W. Blackwood & Sons).—Half-hours in the Green Lanes: J. E. Taylor, F.Z.S. (R. Hardwicke).—The African Sketch Book: Winwood Reade (Smith, Elder & Co.).—Lacerda's Journey to Cazembe in 1798, Translated by Capt. R. F. Burton (J. Murray).—Elements of Mineralogy: James Nicol, F.R.S.E. (A. & C. Black).—Harveian Oration, 1873: G. Rolleston, M.D., F.R.S. (Macmillan & Co.).—Researches in Zoology, 2nd edition: John Blackwall, F.L.S. (J. Van Voorst).

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